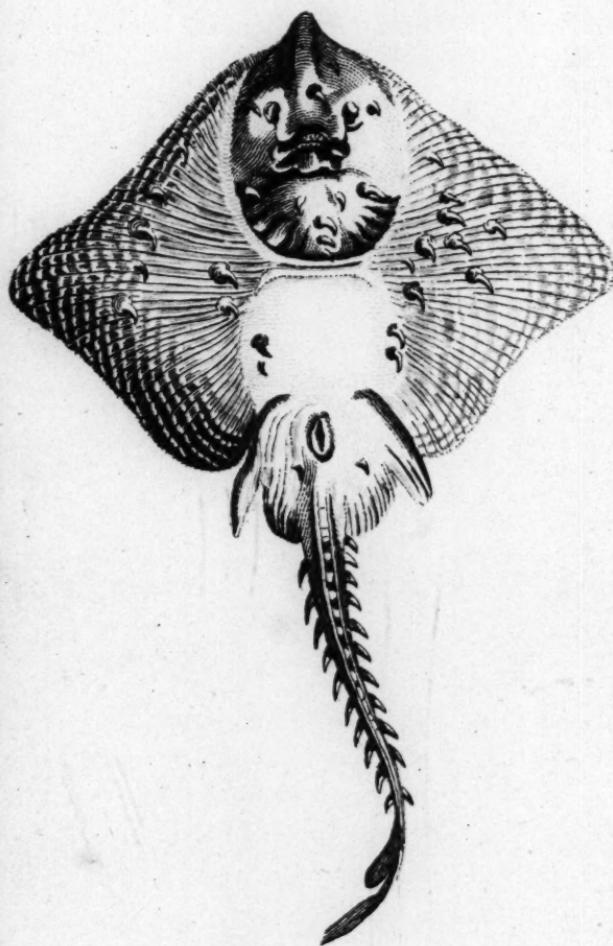
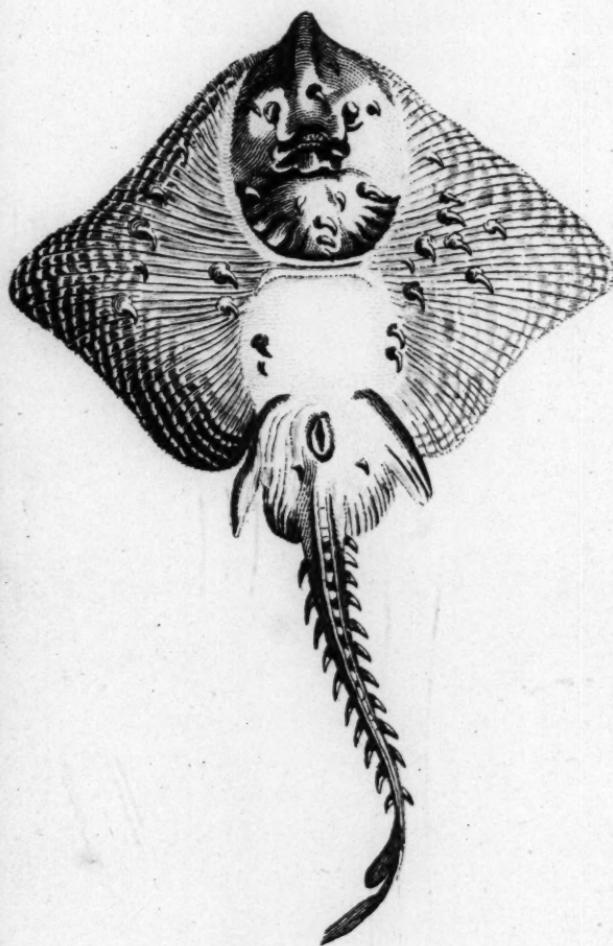


Thornback



Thornback



A

NATURAL HISTORY
of
F I S H E S,

AND OF
REPTILES, INSECTS, WATERS,
EARTHS, FOSSILS, MINERALS,
AND VEGETABLES,

COMPILED FROM THE BEST AUTHORITIES,

AND

ILLUSTRATED BY A GREAT VARIETY OF
COPPER PLATES,

COMPRISED NEAR
ONE HUNDRED FIGURES,
Accurately drawn from Nature, and beautifully engraved.

L O N D O N :

Printed for E. NEWBERY, at the Corner of St. Paul's
Church Yard. 1795.

ЧИТАЛНЯ ДЛЯ ЧИТАТЕЛЕЙ

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ABOUT two years since, A HISTORY OF BEASTS was submitted to the Public by the Compiler of the present work, which was so well received, as to encourage him to offer another volume on the HISTORY OF BIRDS: but to render complete a brief yet comprehensive SYSTEM OF NATURAL HISTORY, the present Volume still seemed wanting; and as it comprises a Description not only of FISHES, REPTILES, and INSECTS, but also of the WATERS and of the EARTH, of the FOS- SIL, MINERAL, and VEGETABLE KING- DOMS, it is hoped that it will be found entitled, at least, to an equal degree of favour from the tutors and guardians of youth, and from the public at large.

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July 1795.

S. J.

CON.

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THE

THE
NATURAL HISTORY
OF
FISHES.

OF FISHES IN GENERAL.

OBSERVING that the ocean is the principal receptacle of the finny tribe of animals, some naturalists have been led to suppose that all fish are naturally of that salt element, and that they have accidentally migrated into fresh water. Some of them, it is true, swim up rivers to deposit their spawn; but the great body of fishes keep to the ocean, and would quickly expire in fresh water. In that extensive abode we may suppose that many reside whose very form is a secret to us. The curiosity and the wants of mankind have, indeed, forced many from their depths; with the figure of these we are acquainted, but for their pursuits, habits, and manners of gestation, those are all hidden in the turbulent element which they inhabit.

According to Linnæus, the number of fish with whose names and figures we are acquainted somewhat exceeds four hundred. Most of them have the same external form, sharp at each end, and swelling in the middle, which enables them with greater celerity and ease to traverse the fluid which they inhabit. That peculiar shape which nature has given to most fishes, human art has endeavoured to imitate in such vessels as are designed to sail with the greatest swiftness; but the progress of such a machine is nothing, compared to the rapidity of an animal. Any of the larger kind of fish can easily overtake a ship in full sail, play round it without any uncommon exertion, and swim before it at pleasure.

The fins are essential to the motion of a fish; by the help of these it migrates with the utmost rapidity, and takes a voyage of a thousand leagues in a season; it is not, however, that fish which has the greatest number of fins, that has always the swiftest motion; the shark, for example, is destitute of the belly-fins, though it is thought to be one of the swiftest swimmers; and the haddock, though completely fitted for swimming, is less rapid in its motion.

The tail, however, which is upright in some fishes, and flat in others, appears to be the grand instrument of motion, the fins being only subservient to it. If the fish is inclined to turn, a stroke with the tail sends it about; but, if the tail strikes both ways, the motion is progressive.

Land

Land animals are generally furnished with a covering to keep off the injuries of the weather; so the inhabitants of the water are covered with a slimy glutinous matter, that defends their bodies from the immediate contact of the surrounding fluid, and assists them in their easy progress through the water.

But, though the fish seems as well furnished with the means of happiness, as quadrupeds or birds; yet, on a close examination of its faculties, we shall find it greatly their inferior. With the sense of *touching*, which is enjoyed in some degree by beasts and birds, the fish, covered up in its own coat of mail, can have but little acquaintance. The sense of *smelling*, so exquisite in beasts, and known a little among birds, is given to fishes in a very moderate degree. All fishes indeed have one or more nostrils; but as air is the only medium we know for the distribution of odours, it cannot be supposed that these inhabitants of the water can be possessed of any power of being affected by them. The sense of *tasting* is very defective among fishes; the palate of most of them is hard and bony, and consequently incapable of the powers of relishing different substances: hence these voracious animals have been often seen to swallow the fisherman's plummet instead of the bait. To the sense of *hearing*, fishes are entire strangers, or they possess it in a very imperfect and limited degree. They are, undoubtedly, possessed of the sense of *seeing*; yet, if we compare it to that of other animals, even this appears obscure. The eyes of most fish are co-

vered with the same transparent skin that covers the rest of the head, which nature seems to have furnished to defend them in the water, as they are without eye-lids.

A ceaseless appetite impels them to encounter every danger, and their rapacity seems insatiable ; yet it is observable, that no other animals can endure the want of food for so long a time. Gold and silver fishes, which are kept in vases, are often seen for months without apparent sustenance : whether they feed on the water-insects, which are too minute for observation, or whether water alone is a sufficient supply, is not evident. Even the pike, one of the most voracious of fishes, will live in a pond where there is none but himself.

Fishes that have very small mouths feed upon worms, and the spawn of others ; some that have larger mouths seek larger prey. Those with the largest mouths pursue almost every thing that has life. The pursuit of fishes, however, is not, like that of terrestrial animals, confined to a single region, or to a single effort : shoals of one species follow those of another through vast tracts of ocean, from the pole even down to the equator.

Though all fish live in the water, yet all require air for their support. When the ice covers the whole surface of a pond, and thus keeps off the air from the subjacent fluid, we sometimes find the fish are all destroyed.

In every light in which we have hitherto considered fish, they appear inferior to land animals ; in the simplicity of their conformation,

in

OF FISHES IN GENERAL.

in their senses, and their enjoyments ; but, as some degree of compensation, they enjoy that humble existence a much longer term than any other class of animated nature. Gesner mentions a carp that was known to be an hundred years old. Buffon also speaks of one of the same age ; and Albertus brings an instance of one that existed upwards of double that period.

But the fecundity of these animals is still more extraordinary than their longevity. Some are viviparous, that is, produce their young alive ; others oviparous, producing eggs : the former are the least prolific, and yet they bring forth in great abundance. The viviparous blenny, for instance, produces two or three hundred at a time, all alive, which immediately divert themselves by playing round the parent. Lewenhoeck assures us, that, in one season, the cod spawns above nine million of eggs : the flounder produces above one million, and the mackarel above five hundred thousand. This amazing increase preserves the species in the midst of innumerable enemies, and furnishes the rest with a sustenance suitable to their nature.

The three grand divisions in the fish kind are, the *cetaceous*, or fishes of the whale kind ; the *cartilaginous*, or those which have gristles instead of bones ; and the *spinous*, or bony kinds, their bones resembling the sharpness of a thorn ; and all these differing from each other in their conformation, their appetites, and their production.

Physicians assure us, that fishes afford but very little nourishment as food, and soon cor-

rupt: that they are cold and moist, and consequently produce juices of the same kind, which are ineffectual in strengthening the body: that they abound in a gross sort of oil and water; that they have few volatile particles, and are therefore less fit to be converted into the substance of our bodies.

CETACEOUS FISH.

THE GREENLAND WHALE.

IS the largest animal of which we have any certain information: it is sometimes found in the northern seas ninety feet in length; but formerly, when the captures were less frequent, and the fish had time to grow, they were taken of a much greater size. Such is their bulk within the arctic circle; but in those of the torrid zone, where they are unmolested, whales are still seen 160 feet long.

It is a large heavy animal, and the head alone makes a third of its bulk: the under lip is much broader than the upper. The tongue is composed of a soft spongy fat, capable of yielding five or six barrels of blubber. The gullet is very small for so vast a fish, not exceeding four inches in width. In the middle of the head are two orifices, through which it spouts water to a vast height, and with a great noise, especially when disturbed or wounded. The eyes are not larger than those of an ox; they are placed towards the back of the head, being the most convenient situation for enabling them to see both before and behind. On the back there

there is no fin, but on the sides, beneath each eye, are two large ones. The tail is broad and in form of a half moon. This whale varies in colour; the back of some being red, and the belly generally white. Some are black, others mottled, others again quite white, and their skin is very smooth and slippery. What is called whalebone adheres to the upper jaw of the animal, and is formed of thin parallel laminae, some of the longest being four yards in length; there are commonly 350 on each side, and in old fish a great many more; of these about 500 are of a length proper for use, the others being too short. They are surrounded with long strong hair, not only to prevent their hurting the tongue, but as strainers to prevent the return of their food when they discharge the water out of their mouths.

Though so bulky an animal, the whale swims with vast swiftness, and generally against the wind. It brings either one or two young at a time. Its food is a certain sort of small snail, and the *medusa*, or sea blubber.

The great resort of this species is within the arctic circle, but they sometimes visit our coasts. It appears that the whale fishery was carried on by the Biscayners long before the English attempted the trade, not only for the sake of the oil, but also of the whalebone, in which they seem to have long trafficked. The great resort of these animals was found to be on the inhospitable shores of Spitzbergen; the European ships made that place their principal fishery, and for a number of years were very successful.

The

The English commenced the business about the year 1598, and the town of Hull had the honour of first attempting that profitable branch of trade. At present it seems to be on the decline, the quantity of fish being greatly reduced by the constant capture for such a vast length of time; the fishers, from a defect of whales, now apply themselves pretty much to the seal fishery, from which animals they extract an oil.

The whale produces its young at the end of nine or ten months, and is fatter at that time than usual, particularly when she is near her time of bringing forth. When she suckles her young, she throws herself on one side on the surface of the sea, and the young ones attach themselves to the teat. She has two breasts, which are white in some, and speckled in others, and are filled with milk, resembling that of land animals. The tenderness of the female for her offspring is very remarkable: wherever she goes she carries it with her, and when closely pursued, keeps it supported between her fins. Even when wounded, she still clasps her progeny. If she plunges to avoid danger, she takes it to the bottom with her, but rises more frequently than usual, in order to give it breath. They are generally seen in shoals of different kinds together, and migrate from one ocean to another in very large companies.

The whale is an inoffensive animal, and consequently has many enemies, which take advantage

vantage of its disposition, and its inability to combat.

The flesh of the whale is considered as a dainty in some nations, and the French seamen sometimes dress and use it as their ordinary diet: the English and Dutch sailors, however, say it is hard and ill-tasted. The savages of Greenland, and those near the south pole, are exceedingly fond of it. They not only eat the flesh, but drink the oil, which they esteem one of their greatest delicacies.

THE CACHALOT, OR SPERMACETI WHALE.

A WHALE of this species was brought into Greenland-dock, by a trading vessel, in January 1762.

Its length was fifty-four feet; breadth fourteen; the length of the lower jaw ten, and the tail measured fifteen feet. Out of his head was taken eight puncheons of spermaceti, which lay between the eyes and the spout-hole, in different cells of the brain.

The skeleton of a whale of this kind was lately shewn at Mr. Rackstraw's exhibition-room in Fleet-street. Those who shewed this curiosity said it would contain thirty people in its head, and fifty in its chest; and that twelve hogsheads of spermaceti oil had been taken out of its upper jaw, or rather that part of the head above it, which was entirely composed of flesh and oil. This whale measured, from the snout to the tail-fin, seventy-two feet.

The

The substance called spermaceti, which is prepared from the brain of this whale, is an excellent balsamic, and a very valuable medicine in diseases of the breast; as also to blunt the sharpness of the humours. It is very efficacious in old coughs, proceeding from fluxions, and in all internal ulcers. Indeed, various are the uses of this medicine, with respect to internal application: when applied externally, it is emollient and vulnerary, and is often used as a cosmetic, to soften the skin, and to render the complexion clear.

OF THE DOLPHIN, THE GRAMPUS, AND THE PORPUS.

THESE fish have all teeth both in the upper and lower jaw, and are much smaller than the whale. The *grampus*, which is the largest, seldom exceeds twenty feet, and may be distinguished by the flatness of its head, resembling in some degree a boat turned upside down. The *porpus* resembles the *grampus* in many things, but the snout is not above eight feet long, and has more the appearance of that of a hog. The *dolphin* greatly resembles the *porpus*, except that its snout is longer and more pointed. They have all fins on the back, very large heads, like the rest of the whale kind, and resemble each other in their appetites, their manners, and conformations; being equally voracious, active, and roving. Indeed no fish could escape them, but from the awkward position of the mouth, which is placed in a manner under the head.

These

These animals are found, the porpus especially, in such vast numbers, in all parts of the sea that surrounds this kingdom, that they are sometimes noxious to seamen when they sail in small vessels. In some places they almost darken the water as they rise to take breath, and particularly before bad weather are much agitated, swimming against the wind, and tumbling about with unusual violence. Whether these motions are the gambols of pleasure, or the agitations of terror, is not certainly known. Probably they dread those seasons of turbulence, when the lesser fishes shrink to the bottom, and their prey no longer present themselves in sufficient abundance. When the weather is fair, they are seen herding together, and pursuing shoals of various fish with great impetuosity. Their method of hunting their game, is to follow in a pack, and thus give each other mutual assistance. At that season, when the mackarel, the herring, the salmon, and other fish of passage, begin to make their appearance, the cetaceous tribes are seen fierce in the pursuit; urging their prey from one creek or bay to another, deterring them from the shallows, driving them towards each other's ambush, and using a greater variety of arts than hounds are seen to exert in pursuing the hare.

So violent, indeed, are these animals in the pursuit of their prey, that they sometimes follow a shoal of small fishes up a fresh water river, from whence they find it difficult to return. We have often seen them taken in the

Thames

Thames at London, both above and below the bridges. The manner of killing them is for four or five boats to spread over the part of the river in which they are seen, and with fire-arms to shoot at them the instant they rise above the water. The fish being thus for some time kept in agitation, requires to come to the surface at quicker intervals, and thus affords the marks-men more frequent opportunities. The por-pus yields a very large quantity of oil; and the lean of some, particularly if the animal be young, is said to be as well tasted as veal. All these animals seem to possess, in a degree proportioned to their bulk, the manners of whales; and the history of one species of cetaceous animals will, in a great measure, serve for all the rest.

OF CARTILAGINOUS FISH.

THE LAMPREY.

LAMPREYS are sea fish, but, like the salmon, they quit the salt waters about the latter end of the winter, or the beginning of spring; and, after a stay of a few months, return again to the ocean, a very few excepted. Though the Severn is the most noted for them, they are found at certain seasons of the year not only in several of our rivers, but in the most considerable of the Scotch and Irish rivers. They are the most in season in the months of March, April, and May.

It has been an ancient custom for the city of Gloucester to present annually to his Ma-jest

jeſty a lamprey pye, covered with a large raised crust.. As this preſent is made at Christmas, the corporation find it extremely difficult at that time to procure any freih lampreys, it being ſo early in the ſeafon; and ſometimes they have been known to purchase them at a guinea a-piece.

Lampreys are ſometimes found that weigh four or five pounds: when either potted or ſtewed, they are reckoned a great delicacy; but they are a ſurfeiting food, as one of our monarchs fatally experienced; the death of Henry the First being occaſioned by a plentiful meal of lampreys.

The mouth of this fish is round, and placed rather obliquely below the end of the nose: the edges are jagged, which enables them to adhēre more ſtrongly to the ſtones, as their cuſtom is; and from which they are not to be drawn off without ſome difficulty. They have twenty rows of ſingle teeth, diſpoſed in circuſar orders, and placed far within the mouth. The colour of the fish is diſtinct, marked with irregular ſpots of dirty yellow, which gives it a diſagreeable appearance.

THE SKATE,

IN proportion to its bulk, is the thinnest of any of the genus, and also the largest, ſome weighing near 100lb. The nose is ſhort and ſharp-pointed; it has a ſet of ſhort ſpines above the eyes: the whole of the upper part is of a pale brown, and ſometimes ſtreaked with black: the lower part is white, marked

with numerous minute black spots: the jaws are covered with small granulated but sharp-pointed teeth. The tail, which is of a moderate length, has two fins near the end of it. One row of spines passes along the top of it, and a few others are irregularly dispersed on the edges. It is remarked, that in the males of this species the fins are full of spines.

Skates are in their highest perfection in the month of May; but all fishes of this kind are ranker when first taken, than when they have been kept for two or three days.

THE SHARP-NOSED RAY.

The nose of this fish is very long, narrow, and sharp-pointed, resembling the end of a spontoon. The body is smooth and thin, in proportion to the size. The upper part is ash-coloured, spotted with a number of white spots, and a few black ones, the lower part is entirely white; the tail is thick, with two small fins toward the end. The mouth is large, and furnished with numerous small sharp teeth, bending inward. On each side of the tail is a row of small spines, and another row runs up the middle.

Mr. Ray mentions the fondness of this animal for human flesh, and the method it takes of destroying men, by overlaying them, and keeping them down by its vast weight, till they are drowned. Ulloa gives exactly the same account of a fish found in the South Seas, which is the terror of those employed in the pearl fishery. It is said to surround, or wrap up, the

unhappy divers, till they are suffocated ; to guard against which, the negroes never plunge into the water without a sharp knife to defend themselves against the assaults of this formidable enemy.

THE ROUGH RAY.

THE rough ray derives its Latin name from the instruments used by fullers in smoothing cloth, the back being rough, with small spines resembling those instruments. These spines are spread over the head, and the upper part of the fins, as well as over the back ; near the eye is a semi-circular order of large spines, and about the nose are a few others ; a row of the same kind extends half-way down the back ; and the tail is armed with a double row of still greater spines. The upper part is a mixture of ash-colour and yellow, and the lower part of the body is entirely white.

THE CRAMP RAY, OR TORPEDO.

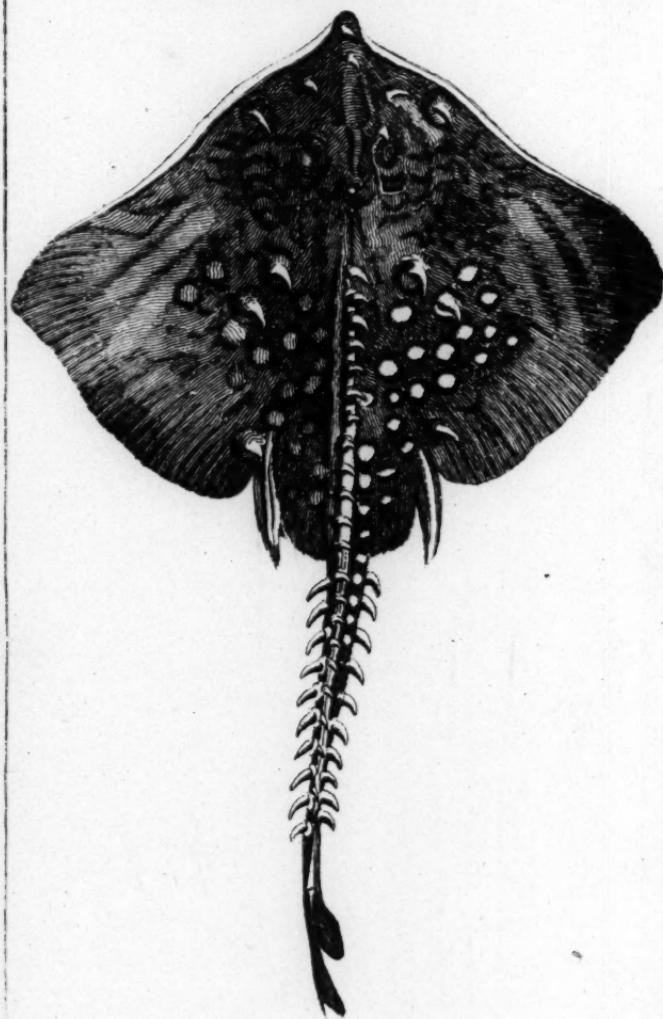
THE torpedo is a well-known formidable animal : the narcotic or numbing quality of this fish has been taken notice of in all ages. The body is almost circular, and thicker than others of the ray kind. The skin is soft, smooth, and of a yellowish colour, marked with large annular spots like the rest of the kind ; the eyes are very small, the tail tapering to a point, and the weight of the fish from five to fifteen pounds. Such is the unaccountable power it possesses, that, when alive, it instantly deprives the person who touches it of the use

of his arm, and even affects him if he touches it with a stick. The shock given by the torpedo resembles the stroke of an electrical machine. Even if one treads upon it with the shoe on, it affects not only the leg, but the whole thigh upwards. This numbness bears no resemblance to that which we feel when a nerve is a long time pressed, and the foot is said to be asleep ; it rather appears like a sudden vapour, which, passing through the pores in an instant, penetrates to the very springs of life, from whence it diffuses itself over the whole body, and gives real pain. The nerves are so affected, that the person struck imagines all the bones of his body, and particularly those of the limb that received the blow, are driven out of joint. All this is accompanied with an universal tremor, a sickness of the stomach, a general convulsion, and a total suspension of the faculties of the mind. There is a double use in this strange power the torpedo is endued with ; it is exerted as a means of defence against voracious fish, which are at a touch deprived of all possibility of seizing their prey ; and by concealing itself in the mud, and numbing the fish that are carelessly swimming about, it makes a ready prey of them. But great as the powers of this fish are when in vigour, they are impaired as it declines in strength, and totally cease when it expires.

Lorenzini, who has made several experiments upon this animal, is of opinion, that its power wholly resides in two thin muscles that cover a part of the back. These he calls the trembling fibres ;



Thornback



fibres ; and he seems convinced, that the animal may be touched with safety in any other part.

The torpedo inhabits hot or warm climates, and is rarely taken in the British seas.

THE THORNBACK.

THE thornback differs from the skate, in being less, and in being armed with a greater number of spines or prickles, from whence it has its name. It has one row on the back, and three on the tail. The shape of the body, exclusive of the tail, is nearly square, but it is rather broader than long. It has no scales, but is covered with a kind of slime, which renders it extremely slippery. The upper part is of a dusky colour, spotted with white, and the belly is entirely white ; the eyes are very prominent, and placed on the upper part of the head, having no bone or any thing else to defend them. On the nose, and on the inner side of the forehead, near the eyes, are a few prickles ; and others are irregularly scattered on the upper part of the pectoral fins.

If a thornback is placed with the belly uppermost, the nostrils appear, and are contiguous to the mouth, which is destitute of teeth ; but the jaw-bones are as rough as a file. The gills, as in other fish of this kind, consist of five holes, placed in a semicircular form ; and there are two semicircles on the lower part of the fish, one encompassing the breast, and the other the lower belly, which is divided from

the upper by a bone, where these circles touch.

Thornbacks are sometimes found to weigh fourteen or fifteen pounds, but with us they seldom exceed eight. They frequent our sandy shores, and are very voracious; they feed on all sorts of flat fish, and are particularly fond of herrings and sand eels. Sometimes they feed upon crustaceous animals, such as crabs, &c. They produce their young in July and August, which (as well as those of the skate) are called MAIDS before they are old enough to breed. In November the thornback begins to be in season, and continues so later than the skate, but the young of both are good at any time of the year. The flesh of the thornback resembles that of a skate, only it is less delicate, and harder of digestion; but the liver is considered by some as a great delicacy.

THE ANGEL FISH.

THIS is also called the monk-fish, and is of a middle nature between rays and sharks, partaking something of the character of both, though an exception to each in the situation of the mouth, which is placed at the extremity of the head; it grows to a very large size, and sometimes weighs upwards of 150 pounds. The back and sides are of a dirty ash-colour, and very rough, and the belly is white. The head is roundish at the extremity, and in each jaw there are three rows of teeth. Like those of all sharks, the animal can raise or depress these

at

at pleasure, by means of muscles uniting them to the jaws, not being lodged in sockets as the teeth of cetaceous fish are. The tongue is broad, and sharp at the end; and the nostrils, which are placed on the upper lip, are wide, and filled with a kind of slime; the eyes are smallish, and behind each is a semilunar orifice. Instead of gills, it has five holes like the thorn-back. It has two fins, placed near the head, which resemble wings, and is therefore called the angel fish.

This fish is frequently found on our coasts, where it prowls about for prey, like others of the kind. It is extremely fierce, and dangerous to be approached. Mr. Pennant relates an instance of a fisherman, whose leg was terribly torn by a large one of this species, which lay within his nets in shallow water, and which he went to lay hold of incautiously.

Their skin, which is very rough, was used by the antients to polish wood and ivory, for which purposes the moderns use that of the greater dog fish. The flesh was formerly thought a delicacy, but is now neglected even by the poorest people, on account of its coarseness and rankness.

THE PICKED DOG FISH.

THIS fish has its name from a strong sharp spine, placed before each of the back fins, which distinguishes it from the rest of the British sharks. It has a roundish oblong body, which is covered with a rough skin; the back is of a brownish ash-colour, and the belly is

white, and smoother than the other parts ; the eyes are oblong, and covered with a double membrane. The mouth is placed just under the eyes, and is armed with a double row of small teeth, which bend from the middle of each jaw towards the corners of the mouth. The nose is long, and extends greatly beyond the mouth, but is blunt at the end. It has no fin on the lower part of the body, between the vent and the tail, by which it may be distinguished from all other fish of this kind. It grows to the weight of about twenty pounds, and is frequently taken in the British ocean and the Irish sea.

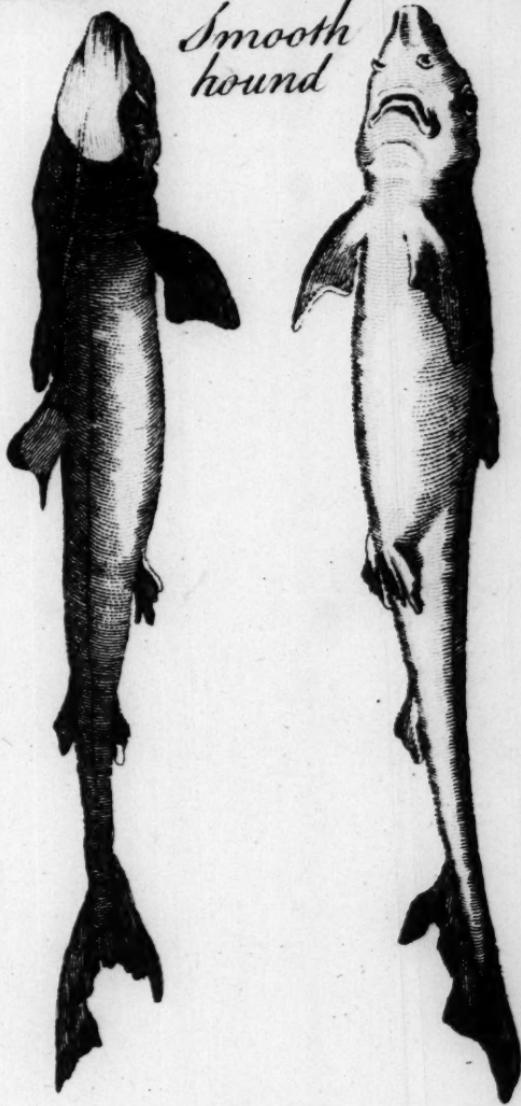
THE SMOOTH HOUND.

THIS fish is destitute of teeth, but to supply the defect, the bones of each jaw are as rough as a file. The skin, as its name implies, is smooth, and without the spines ; but that of all others of this kind is rough : by this difference, it may be readily distinguished from the picked dog fish.

THE FISHING FROG, or FROG FISH.

THE frog fish resembles a tadpole or young frog in shape, but it appears a tadpole of enormous size, for it sometimes exceeds five feet in length, and has a mouth above a yard wide. Its deformity is not to be exceeded : the head is considerably larger than the whole body ; the under jaw projects beyond the upper, and both are armed with sharp slender teeth : there are also teeth in the palate, and at the root of the

*Smooth
hound*





the tongue, which is large and broad; the eyes are placed at the top of the head, and are encompassed with prickles: immediately above the nose are two long strings or filaments, which resemble a fishing-line, and it is said the animal converts them to the purposes of fishing. The back is flat and greyish, with somewhat of a reddish and greenish cast: it has three bristles or strings on the middle of the back, which seem to supply the place of a fin, and several strings, resembling fins, hang round the body: two fins are placed under the throat, which resemble the feet of a mole, by the assistance of which they creep at the bottom of the sea.

The flesh of the frog fish is white when boiled, and tastes like that of a frog.

THE WHITE SHARK.

OF all the inhabitants of the deep, those of the shark kind are the fiercest and most voracious. In size, the great white shark approaches nearly to the whale, and far surpasses him in celerity and strength, in the formidable arrangement of his teeth, and his insatiable desire of plunder. Gillius informs us, that this kind will grow to the weight of four thousand pounds, and that in the stomach of one of them a human body was found entire.

The head is large and flattish; the eyes are also large, and the snout is long. The mouth is enormously wide, placed far beneath, and therefore these, as well as the rest of the shark kind, are said to be obliged to turn on their backs

backs to seize their prey. The throat is extremely wide, and capable of swallowing a man with the greatest ease. But its furniture of teeth is still more terrible ; of these there are six rows, which are flat, triangular, exceedingly sharp at their edges, and finely serrated. When the fish is in a state of repose, this dreadful apparatus lies flat in the mouth, but when it seizes its prey, it has a power of erecting them, by the assistance of a set of muscles that join them to the jaw.

The other parts of this fish are almost equally terrible to behold. Its pectoral fins are very large ; it is furnished with large eyes, which it turns with pleasure on every side, and can behold its prey behind it as well as before : its whole aspect is marked with a character of malignity. The tail is of a semilunar form, but the upper part is longer than the lower. It has vast strength in the tail, and can strike with amazing force, on which account the sailors cut it off with an axe as soon as they have got it on board. The colour of the whole body and fins of this animal is a light grey ; its skin is rough, hard, and prickly, and is that substance that covers instrument cases, called shagreen.

The depredations this animal commits are frequent and formidable : in all hot climates he is the dread of the sailors, where he constantly attends the ships in expectation of what may fall overboard.

So great is the rapacity of the shark, that nothing which has life is rejected by it : but human

human flesh appears to be its most favourite food; when once it has fed upon mankind, it continually haunts those places where it expects a return of its prey: it is, however, asserted, that this voracious fish will take the black man's flesh in preference to the white.

The usual method of taking a shark, is to bait a hook with a piece of beef or pork, which the sailors throw into the sea affixed to a strong cord, strengthened near the hook with an iron chain; as without such precaution the shark would presently bite the cord in two, and set himself at liberty. He approaches it, swims round it, and examines it, and appears for a time to neglect it; but when the sailors make a pretence, by drawing the rope, as if intending to take the bait away, then his hunger excites him, he darts at the bait, and swallows it, hook and all. When he finds the hook lodged in his maw, he exercises his utmost efforts to continue in his natural element; but when his strength is exhausted, he suffers his head to be drawn above water; the sailors confine his tail by a noose, draw him on shipboard, and dispatch him as soon as possible, by beating him on the head; yet even this is attended with difficulty and danger, the enormous creature, terrible even in the agonies of death, still struggles with his destroyers, and is the most difficult to be killed of any animal in the world.

Their flesh, which is sometimes eaten, is exceedingly coarse and rank, and hardly digestible by any but the negroes, who are remarkably fond of it.

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The species called the **BLUE SHARK**, frequents many of our coasts, particularly those of Cornwall, during the pilchard season.

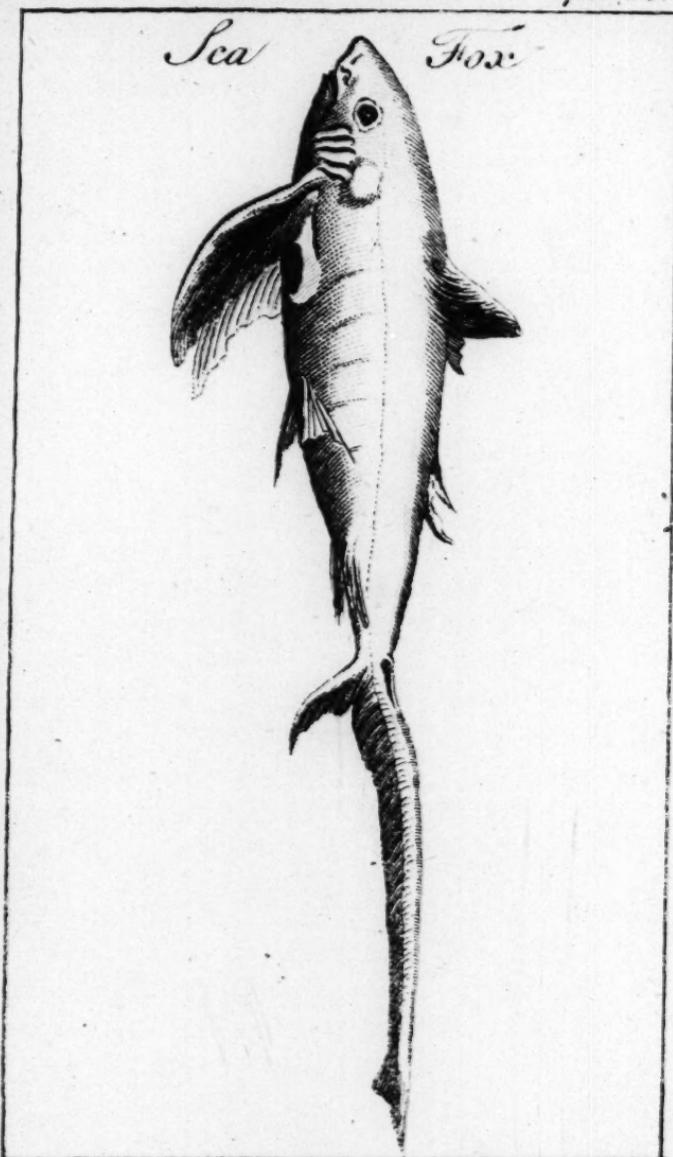
THE SEA FOX, OR SEA APE.

THIS animal is called the sea fox on account of the length of its tail, and the rank smell of its flesh, which is not unlike that of the fox. It is sometimes found so large as to weigh upwards of 100 pounds, and has a round short body, and a small mouth a little below the snout, which is sharp, and armed with teeth. The belly of this fish is white, and the back of an ash-colour. It is principally remarkable for the great length of its tail, which resembles a sword, is as long as the whole body, and has a fin at the root of it. It is usually met with in the Mediterranean, and is sometimes taken in our seas.

THE SAW FISH.

THIS animal has its name from a saw, which the bones of its nose are supposed to resemble; but they bear a greater similitude to the teeth of a comb, placed at some distance from each other: they are placed on each side of the bone, and are from twenty to thirty in number, and some of them are near five feet in length, when the body of the fish is about ten feet. The back of this fish is of an ash-colour, and the belly white: it has no teeth in its mouth, which is transversely cleft, but the lips are as rough as a file. The saw fish has no fins on the back, and four on the belly, two on each





each side, those next the head being the broadest and the longest. The eyes stand high out of the head, and the mouth is directly underneath the eyes: the nostrils are oblong. These animals are great enemies to the whale and fin fish, many of them assembling round one, which they never quit till they have destroyed. They feed only on his tongue, and leave the rest behind. The saw fish inhabits different parts of the ocean, but in the north seas they are found in the greatest plenty.

THE STURGEON.

THE sturgeon grows to the length of eighteen feet, and to the weight of 500 pounds, but it is seldom taken in our rivers of that bulk. The nose is very long, slender, and ends in a point; on the lower part of the nose are four beards: the mouth, which is situated far beneath, is small, and unsupported by any jaw bones; neither is it furnished with any teeth. The eyes are extremely small, and the nostrils are placed near them. The upper part of the body is of a dirty olive colour, the lower part silvery, and the middle of the tubercles white. It is an exception among the cartilaginous fish in the manner of breeding, being like the bony fish oviparous, spawning in winter. In its general form it resembles a fresh-water pike; though it is harmless and ill provided for war, the body is formidable enough to appearance. It is long, pentagonal, and covered with five rows of large bony knobs, one row on the back, and two on each side, and a number of

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fins to give it greater expedition. Of this fish there are three kinds, the common sturgeon, the caviare sturgeon, and the huso, or isinglafs fish. The first is the sturgeon, the flesh of which is sent pickled into all parts of Europe. The second is the fish from the roe of which that celebrated delicacy called caviare is made; and the third, besides supplying the caviare, furnishes also the valuable commodity of isinglafs: they all grow to a very large size.

This fish visits every country in Europe at different seasons; it annually ascends the largest rivers to spawn, and propagates in an amazing number. It is often accidentally taken in our rivers in salmon nets, particularly in those parts that are not far remote from the sea. The largest we have heard of caught in Great Britain, was a fish taken in the Esk, where they are most frequently found, which weighed 460 pounds. An enormous size to those who have only seen our fresh water fishes.

As the sturgeon is not a voracious fish, it is never caught by a bait in the ordinary manner of fishing, but always in nets. Indeed, it never attempts to seize any of the finny tribe, but lives by rooting at the bottom of the sea, where it makes insects and sea plants its whole subsistence. The sturgeon is as timid in its nature as temperate in its appetites. There would be scarcely any method of taking it, did not its natural desire of propagation induce it to incur so great a variety of dangers. The smallest fish is alone sufficient to terrify a shoal of sturgeons, for being unfurnished with any

weapon

weapon of defence, they trust entirely to their swiftness, and their caution for security. Like all animals that do not make war upon others, sturgeons live in society among themselves, rather for the purposes of pleasure, than from any power of mutual protection.

The flesh of the sturgeon pickled is very well known at all the tables of Europe, and the belly is reckoned the best. It contains much oil and volatile salt, and yields a nourishing and solid food, because of its thick and gross juices.

THE SUN FISH

HAS a broad short body, covered behind with a circular fin, which answers the purpose of a tail, so that it has the appearance of a bulky head, and the body seems to have been cut off in the middle. Its ordinary length is about ten feet, though it is sometimes found to weigh upwards of 100 pounds. It has a large rough thick skin, but no scales : the back is blackish, and the belly of a silver white ; but both the belly and back terminate in a sharp ridge. In proportion to the size of the fish, the mouth is very small, and when opened is roundish. The jaws, which are hard and rough, are armed with several rows of sharp teeth. The eyes are small, and before each is a semicircular aperture ; the pectoral fins are very small, and placed behind them. The dorsal and the anal fins are high, and placed at the extremity of the body : the tail fin is narrower.

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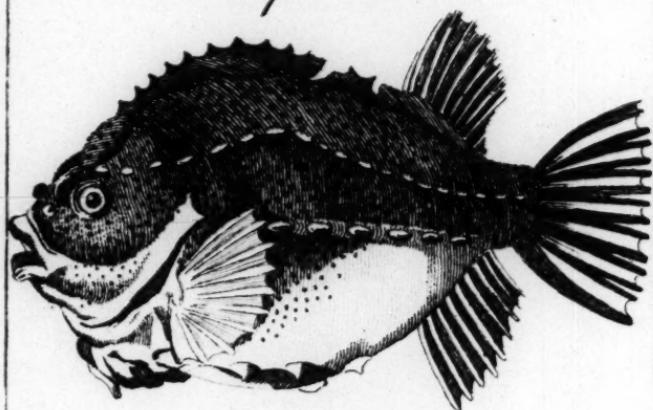
There seems to be no satisfactory reason for calling this animal the sun fish; perhaps from the roundness of its body, or from its shining in the night. It is found in the Mediterranean sea, in the ocean, and on the coasts of Cornwall. When boiled, it becomes a glutinous jelly, resembling boiled starch when cold, and serves the purposes of glue.

THE LUMP FISH.

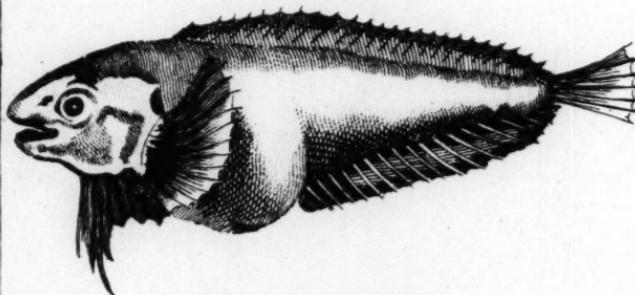
THIS is also called the sea owl, and in Scotland the cock paddle. This singular fish increases to the weight of four pounds, and the length of sixteen inches; the shape of the body is like that of the bream, deep, but very thick, and it swims edgeways. It is of a blackish colour, a little tinctured with red: it has no scales, but the skin is rough, with sharp tubercles of a blackish colour in every part. There are three rows of crooked spines or prickles on each side, and another row of the same on the top of the back. The belly is of a bright crimson colour; the pectoral fins are large and broad, almost uniting at their base. Beneath this is the part by which it adheres to rocks, &c. under the water, and this so firmly, that it is very difficult to remove it. It consists of an oval aperture, surrounded with a muscular and soft substance, edged with small appendages like threads, which concur as so many claspers. By the assistance of this part, it adheres firmly to whatever it pleases. On putting a fish of this species, just caught, into a pail of water, it fixes itself with such force to the bottom, that



Lump Fish



Sea Snail



that on taking the fish by the tail, the whole pail may be lifted up, though it holds some gallons, and that without removing the fish from its hold.

The mouth of the lump fish resembles that of the sun fish, but is somewhat larger: the lips are flat and thick; the jaws are full of teeth, and the nostrils are tubes or pipes which rise above the skin.

These fish are found in great abundance in the Greenland seas, during the months of April and May, when they approach the shore to spawn.

THE SEA SNAIL.

THIS animal takes its name from the soft and unctuous texture of its body, resembling the snail upon land; it is almost transparent, and quickly dissolves and melts away. It is but a small fish, not exceeding five inches in length. When fresh taken, the colour is of a pale brown: the shape of the body is round, and the back fin extends from the head to the tail. Beneath the throat is a round depression, of a whitish colour, surrounded by twelve broken spots, placed in a circle. The head is large, thick, and round; the jaws are very rough, but are destitute of teeth: the belly is white and very protuberant. It adheres to the rocks, &c. like the other species, and is found in the sea, near the mouths of great rivers.

THE EEL.

THE PIPE FISH.

THE body of this fish, in the thickest part, is not thicker than a swan's quill, when the animal is about sixteen inches long. This is angular, but as the angles are not very sharp, they are hardly discernible till the fish is dried. The general colour of this fish is an olive brown, marked with several blueish lines, pointing from the back to the belly, which, in dried fish, appear like the signs of so many joints. They are viviparous, for on crushing one immediately after it was taken, hundreds of minute young ones were perceived to crawl out.

OF SPINOUS FISHES.

THE EEL.

THIS is a very singular fish in many things that relate to its natural history, and in some respects borders on the nature of the reptile tribe. During the night it will quit its element to wander along the meadows, not only for the sake of the change of habitation, but also for prey, feeding on the snails which it discovers in its passage. In winter it sinks deep into the mud, and continues in a state of rest like the serpent kind.

Eels are viviparous animals, extremely voracious, and very destructive to the fry of fish. They will live out of water longer than any fish, and are extremely tenacious of life, as their parts will move a considerable time after they are cut in pieces.

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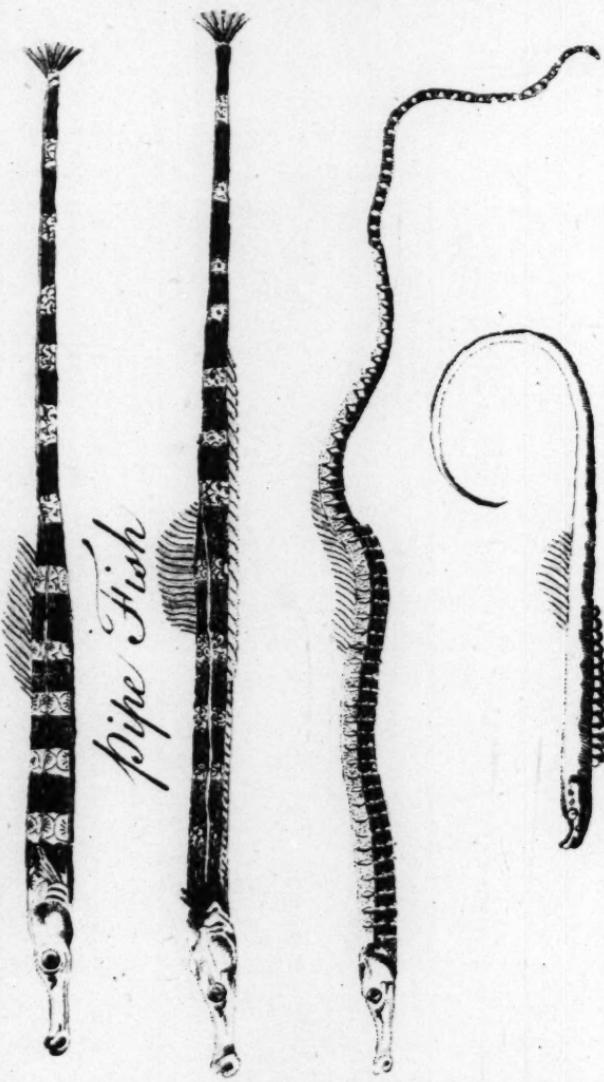


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Pipe Fish

The eyes of the eel are placed at a small distance from the end of the nose: the iris of the eye is tinged with red; the teeth are small, sharp, and numerous: the under jaw is longer than the upper: beneath each eye is a minute orifice, and at the end of the nose two others, which are small and tubular. The eel has a pair of pectoral fins, rounded at their ends; it has also a narrow fin on the back, uniting with that of the tail, and the anal fin joins in the same manner beneath: the orifice to the gills is behind the pectoral fin.

Eels differ in their colours, from a footy hue to a light olive green: those which are called silver eels, have white bellies, and a remarkable clearness throughout.

There is a variety of this fish, known in the Thames by the name of grigs, and about Oxford by that of grigs or gluts: they have a larger head, a blunter nose, and a thicker skin than the common sort; neither are they so fat, or so much esteemed, nor do they often exceed three pounds in weight. Common eels sometimes grow so large as to weigh upwards of twenty pounds, but that is extremely rare. Those which are found in rivers, or other clear running waters, are the best; as to the size it is immaterial: the liver and the gall are extremely acrid. Boerhaave says, that no fishes have a more acrid gall, and that with a mixture of the galls of the eel and the pike, made into pills, he has cured many ricketty children with hard and swelled bellies.

The torporific eel, called **GYMNOTUS ELECTRICUS**, or the **ELECTRICAL EEL**, found in **Guiana**,

Guiana, in South America, if caught by a hook, violently shocks the person who holds the line: the same eel touched with an iron rod, held in the hand of a person whose other hand is joined to another, &c. communicates a violent shock to ten or twelve persons thus joining hands, in a manner exactly similar to that of the electric machine. No shock is perceived by the holding the hand in the water near the fish when it is neither displeased nor touched; but if it is angry, it can give a shock to a person at five or six inches distance. This shock is produced by an emission of electric particles, which the fish discharges at pleasure. On the death of the animal, no such electric property remains, and then the Indians eat it.

The eel is a fresh-water fish; yet sometimes it is found in the sea; not that it is produced there, but because it goes often out of the rivers into the sea, and so back again into rivers; it delights in pure and running waters, and they assure us it grows lean, poor, and dies at last, when confined to muddy water. It requires also a great deal of water, for otherwise it dies. It is said it cannot bear any considerable difference of living; for in case it should in summer time be conveyed into a much colder water than that wherein it was before, it is soon destroyed. In the mean time, it is asserted, that it can live out of the water five or six days, provided the north wind blows at that time: it feeds upon roots, herbs, fish, insects, and any thing it can find in the bottom of rivers. This fish lives commonly seven or eight years.

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The eel is good aliment, and much used, being tender, soft, and nourishing.

THE CONGER, OR CONGER EEL.

THIS fish grows to an enormous size. Dr. Borlace assures us, that they are sometimes taken near Mount Bay, of 100 pounds weight: and we have been informed, that some have been taken near Scarborough, which were ten feet and a half in length, and eighteen inches in circumference in the thickest part. The shape of the conger eel is somewhat like that of the common eel, but they differ from it in the following particulars: their colour is darker, their eyes are much larger in proportion, and the iris is of a silver colour. On each side it has a straight white broadish line, extending from the head to the tail, which seems composed of a double row of points. The fin placed on the body has its upper edge blackish throughout the whole length.

Congers are extremely voracious, preying upon other fish. They, as well as other eels in general, are remarkably fond of carcasses of any kind, and are frequently found lodged in those that have been accidentally taken up. Congers are an article of commerce in Cornwall, great quantities being taken on that coast, and exported to Spain and Portugal.

Fishermen are much afraid of a large conger, lest it should endanger their legs by clinging round them, therefore they kill them as soon as possible, by striking them on the navel.

In curing them, they are slit, and hung on a frame to dry ; having a vast quantity of fat, which it is necessary should exude before they are fit for use. It is said, that a conger of an hundred weight will waste by drying to twenty-four pounds.

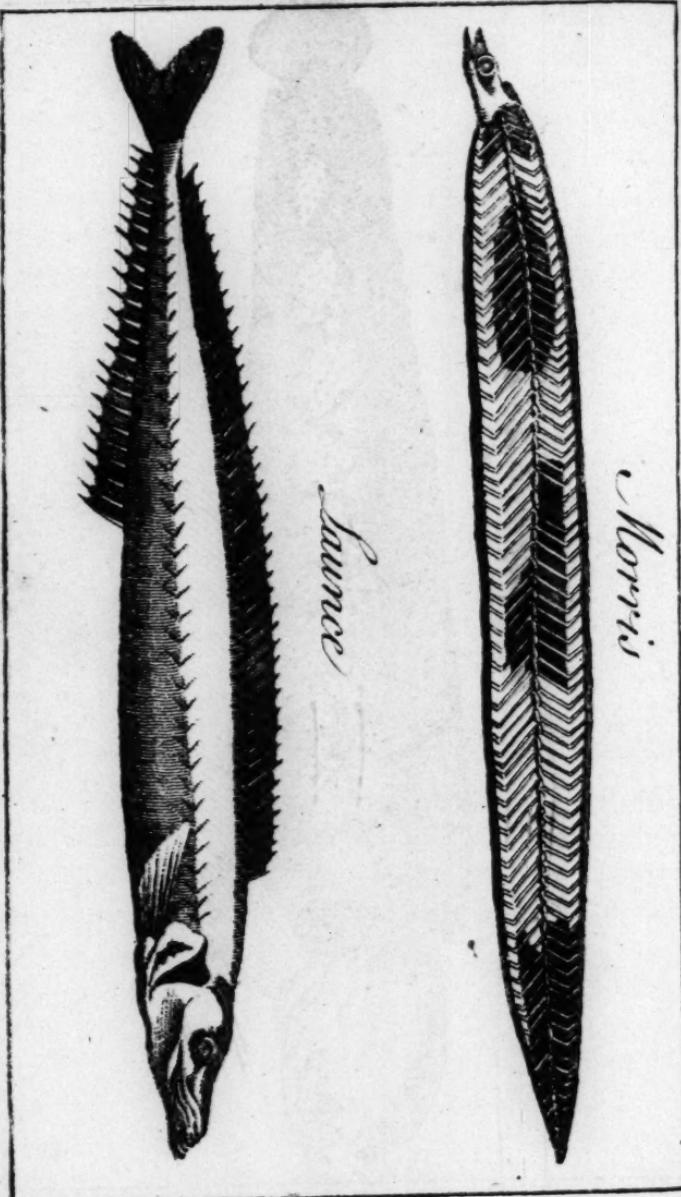
THE WOLF FISH, OR SEA WOLF.

THIS animal has a smooth slippery body, without scales. It somewhat resembles an eel, but is of a brownish grey, and the sides are adorned with blackish transverse shades. The head is large, and flat above the eyes, and the cheeks appear swelled and puffed out. It is a most voracious fish, and, when taken, will fasten on any thing within its reach. The fishermen, dreading its bite, endeavour to disarm it as soon as possible, they immediately pull out its fore teeth, and then kill it by striking it behind the head. The Danish and German writers say, that its bite is so hard, that it will seize on an anchor, and leave the mark of its teeth in it ; and that the animal is capable of crushing even stones with its jaws. It feeds principally on crustaceous animals and shell fish ; and is common in the sea near Yorkshire and Northumberland.

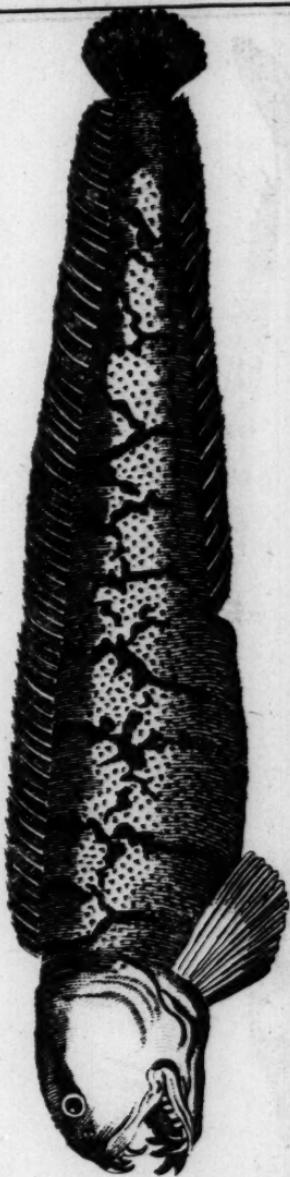
THE SAND EEL, OR LAUNCE,

RESEMBLES the common eel in shape, being long and round, but it seldom exceeds nine or ten inches in length. The colour of the skin is blue, varying with green ; the sides and back are of a silver white. It is destitute of scales,





Sea Wolff





scales, has a sharp snout, and a wide mouth without teeth: the lower jaw is longer than the upper, and the upper jaw is moveable, and capable of being protruded; so that, when open, the gape is very wide. It has a long fin, which extends almost the whole length of the back, is very narrow; and consists of fifty-eight rays: there is also a pair of fins at the gills, but none on the belly. The iris is silvery. The tail is forked, but the lobes are rounded at their extremities.

These fish are found on most of our sandy shores, during the summer months. They are very delicate eating, but are generally used as baits for other fish.

THE SWORD FISH.

THE snout of this fish is the upper jaw produced to a great length, and has some resemblance to a sword, from whence it takes its name. They have been seen upwards of fifteen feet in length, and 200 pounds in weight. The head is thick, the body long and round, but grows gradually smaller towards the tail. The snout is one third of the whole length of the fish, and is compressed at the top and the bottom, but sharp at the point: the under jaw is about four times as short as the upper, and is also sharp-pointed. The mouth is destitute of teeth.

The skin of the sword fish is rough but very thin: the colour of the back is dusky, that of the belly a silver white. The dorsal fin begins a little above the gills, and extends almost to

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the tail. The tail is forked, and almost in the shape of a crescent, and it has only one pair of fins at the gills.

The sword fish is extremely voracious, and particularly a great enemy to the tunny.

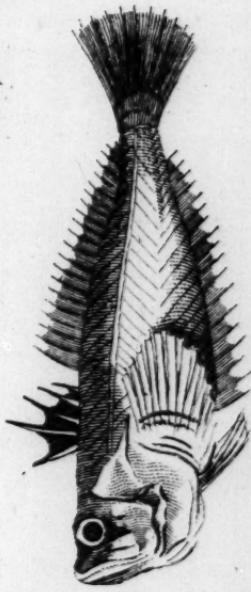
It sometimes frequents our coasts, but is much more common in the Mediterranean sea, especially in that part which separates Italy from Sicily, which has been long celebrated for it. It is taken by means of a spear or harpoon.

THE DRAGON FISH.

THE head of this fish is large and flat at the top ; there are two orifices in the hind part, through which it breathes, and through which it also forces out the water it takes in at the mouth, in the same manner as the cetaceous fish. The eyes, which are large, are placed very near each other on the upper part of the head, so that in their natural position they look upwards : the pupils are of a rich sappharine blue, and the irides of a fine yellow. The upper jaw projects much farther than the lower ; the mouth is very wide, and the teeth are small. It is found as far north as Spitzbergen, and as far south as the Mediterranean sea. It is also frequently seen on the Scarborough coasts. The colours are yellow, blue, and white ; the fish making a beautiful appearance when it is just taken. This species grows to the length of about ten inches ; the body is slender, round, and smooth.

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Weever'



THE SMALL DRAGON FISH.

THIS species is of a yellowish green colour on the back, and white on the belly; the sides are speckled with small spots of a bluish silver colour. It may be distinguished from all other small fish by the spots just mentioned, by the round holes of the gills, by three pointed prickles at the corners of the gills, by the rays of the fore back-fin rising higher than the membrane that connects them, and by the jaws being furnished with exceeding small teeth. The mouth is small, the eyes large, and almost contiguous. The small dragon fish is seldom seen to exceed six or seven inches.

THE WEAVER.

THIS fish is also called the dragon. It is a long fish, with flat sides, a straight back, and a prominent belly. The lines on the sides are partly yellow, and partly dusky, running obliquely from the back to the belly; the scales are thin and small, and the head moderately compressed: the eyes are placed on the top of the snout, and very near together. The iris of the eyes is yellow; the under jaw is longer than the upper, and slopes very much towards the belly: the teeth are small; the forward back-fin has six rays; the fin behind this, and which is almost close to it, reaches very near the tail.

This fish grows to the length of twelve inches. It buries itself in the sands somewhat like the sand-eel, leaving only its nose out: and, when trod upon, strikes with great violence, and in-

flicts a very dangerous wound. The weaver is very delicate food.

THE COMMON COD FISH.

THE cod inhabits only the northern part of the world: immense quantities are found on the banks of Newfoundland, and the other sand banks that lie off the coasts of Cape Breton, Nova Scotia, and New England. It is probable they are tempted to resort there on account of the quantity of worms produced in those sandy bottoms. Another cause of their particular attachment to these spots, is their vicinity to the polar seas, where they return to spawn.

The fishing banks of Newfoundland are a sort of mountains covered with the sea: one of these is deservedly called the Great Bank, for it extends 450 miles in length, and upwards of 100 in breadth. It is about seventy-five miles from the island of Newfoundland, in America: the largest, best, and fattest cod, are those taken on the south side of the bank; those on the north side being considerably smaller. The season for catching them on this bank, is from the beginning of February to the beginning of May. Those that are taken in May and June will keep tolerably well; but those which are caught in July, August, and September, will spoil in a very short time, unless extraordinary care be taken of them. Sometimes, indeed, this fishing is over in a month or six weeks, and at other times it continues upwards of six months.

When

When Lent approaches, the fishermen hasten homewards, though they have not caught above half of their cargo, because the markets at that time are best. Sometimes, however, they make a second voyage, before others have got a sufficient cargo for the first. They are all taken with a line and hook baited with the entrails of cod-fish, a small fish called capelin, and a shell-fish called chams ; and an expert fisherman will catch four or five hundred in a day.

The increase of shipping that now resort to the fertile banks of Newfoundland is astonishing. Great Britain still enjoys the greatest share ; which ought be esteemed our chief treasure, as it brings strength to the state, and wealth to individuals.

Providence hath benevolently ordained, that this fish, so useful to mankind, should be so very prolific as to supply more than the deficiencies of the multitudes annually taken. Leuwenhoek counted nine millions, three hundred and eighty-four thousand eggs in a cod-fish of a middling size.

Those fish are most esteemed for the table, which are of a middling size, and they are to be chosen by their plumpness or roundness, especially near the tail, and by the regular undulated appearance of the sides, as if they were ribbed. These, and other fish of this genus, are in the highest season in winter ; but the glutinous parts about the head lose their delicate flavour, after they have been twenty-four hours out of the water.

The general weight of those taken on our coasts is from fourteen to forty pounds, though they are sometimes found to weigh sixty or even七十 pounds.

The cod-fish is short in proportion to its bulk; the belly is very large and prominent: the jaws are of an equal length, with a small beard on the lower jaw: the teeth are disposed in the palate as well as the jaws: the eyes are large. This fish has three soft fins on the back: the ventral fins are very slender: and it has two anal fins. It is ash-coloured on the back and sides, and usually spotted with yellow: the belly is generally white; though they sometimes vary not only in colour, but in shape, especially that of the head. It has a side line, which is broad, straight, and white, till it reaches opposite the vent, when it curves towards the tail.

Cod-fish are salted in the following manner on board the ships: the head is cut off, the belly opened, and the guts taken out: and then they are laid side by side, head to tail, at the bottom of the vessels, for about eight or ten feet square. One layer being completed, it is covered with salt, and another laid upon that, which is covered as before. All the fish that are taken in one day are thus disposed of; but great caution is used not to cure those which have been caught on different days. They remain thus for three or four days, and are then removed into another part of the vessel, and salted again. They are suffered to remain thus till the vessel has procured its full cargo, or till they depart for their destined port. Sometimes they are put into

into barrels and packed up, and they then go under the denomination of barrel-cod.

The tripes, tongues, and rows of the cod-fish, are also salted and barrelled up; the latter of which are of service to throw into the sea, in order to draw other fish together, particularly pilchards. An oil is taken from this fish, which answers all the purposes of train oil; and is much used for dressing leather.

THE HADDOCK.

THE haddock is of a middle size between a whiting and a cod. The back is blackish, and covered with small scales. A black line extends from the upper corner of the gills to the tail; and on the middle of each side, not far from the gills, there is a large black spot, which distinguishes it from all others. Superstition assigns this mark to the impression St. Peter left with his finger and thumb, when he took the tribute out of the mouth of a fish of this species, which has, ever since that miracle, been continued to the whole race of haddocks. The belly and lower parts of the sides are silvery. The eyes are large; a barb hangs from the lower jaw, and the tail is forked. In other respects it resembles a cod; and particularly on the back, are three fins, resembling those of the common cod.

Large haddocks begin to be in roe about the middle of November, and continue so till the end of January; from which time, till May, they are very thin tailed, and much out of season. The small ones are extremely good from

May till February; and those which are not old enough to breed are good in February, March, and April.

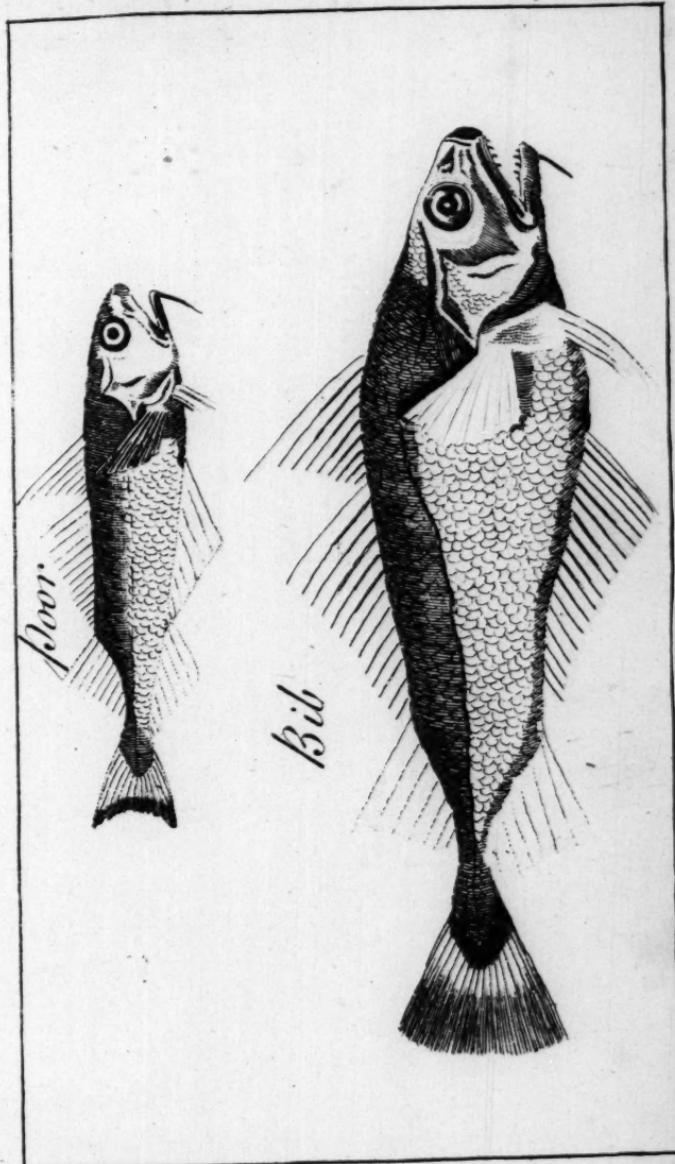
THE WHITING.

THE whiting is a fish of an elegant make, and differs from all other fish of this kind, in having the upper jaw longer than the lower; and in the teeth, which appear out of the mouth when it is shut. It has no barb, and the belly fins are placed more forward than they are in the others. It is a slender fish of its size, especially towards the tail, for about the head it is considerably larger in proportion. The head and back are of a pale brown, the belly is silvery; the lateral line is white and crooked: the fins below the vent are speckled with black. The scales are small; the eyes are large, and covered with a transparent loose skin.

They are the most delicate as well as the most wholesome of any of the genus, but never grow very large; the usual length being ten or twelve inches, though they have been seen twenty inches long. In spring they appear in vast shoals in our seas, from half a mile to three miles from the shore. Vast numbers of them are taken by the line, and they afford excellent diversion to the angler.

THE BIB OR BLIND.

THE bib has a barb under its chin, in which particular it agrees with the cod; but it differs from it in size, shape, and colour; being shorter, broader, and whiter. The scales adhere closely





closely to the skin, and are twice as large as those of the cod. The cod is also furnished with a spine or thorn at the tail fin, of which this fish is destitute: it grows to the length of eleven or twelve inches: the body is deep, and the sides compressed: the eyes are covered with a loose membrane, which it is said the fish can blow up like a bladder: the mouth is small, and the teeth are disposed like others of the kind. It is esteemed delicate food, and resembles the whiting in taste.

THE POOR.

THE poor is the only species of cod-fish with three dorsal fins that has hitherto been found in the Mediterranean sea. It is found near Martigues, and sometimes in such amazing quantities as to become a perfect nuisance; for no other kinds of fish are taken during that time. It is pretty good for food, but cannot be either salted or dried. It is a very small species, not exceeding six inches in length. The back is of a light brown colour, and the belly of a dirty white; the eyes are covered with a loose membrane: on the chin is a small beard; and on the gill-covers, and the jaws, there are nine punctures on each side.

THE HAKE.

THESE fish are from a foot and an half to two feet and an half in length. It is of a slender form, like that of the river-pike, and is therefore sometimes called the sea-pike. The back is of a pale ash-colour, and the belly of a dirty

dirty white, with small scales. The head is broad and flat, and the mouth large, and full of sharp teeth, like that of a pike: the eyes are large, and of a gold colour, being covered with a transparent membrane. The tail is not forked, but terminates in a right line.

The hake is from a foot and an half to near twice that length: it is esteemed a very coarse fish in England, and is seldom admitted to table either fresh or salted. It is known by the name of **POOR JOHN** when it is cured.

THE LING.

THIS fish takes its name from its length, being a corruption of the word *long*. It resembles the hake both in shape and colour, except that it is longer, and its scales are not closely adhering to the skin. The body is slender; the head flattish; the upper jaw longer than the lower: the teeth in the upper jaw are small and very numerous; those in the lower are few, slender, and sharp. It has a small beard on the chin. The tail is round, not forked; and on the back fin there are a multitude of rays. The usual size of a ling is from three to four feet in length; but they are sometimes upwards of seven feet long.

The flesh is much better and wholsomer than that of the hake, and is indeed, when cured, preferred to all other salt fish.

They abound about the Scilly Isles, on the coasts of Scarborough, and those of Scotland and Ireland, and form a very considerable article of commerce. They are in perfection in

the

the Yorkshire seas, from the beginning of February to the middle of May.

THE BURBOT, OR EEL POUT.

THE body of this fish has some resemblance to that of an eel, except that it is shorter and thicker: its motions also resemble those of the eel; and it is equally smooth, slippery, and slimy. The head is broad and depressed like that of a toad, and the jaws are furnished with very small teeth, which make them as rough as a file. The tail is flat and roundish. A barb of about half an inch long grows on the under jaw; and there are two short barbs between the nostrils and the snout. The colour of this species varies; some being dusky, others of a dirty green, spotted with black, and sometimes with yellow. Its usual size is from fourteen to twenty inches.

The burbot is found in the Trent, the Witham, and in the great Eastfen in Lincolnshire. Though of a very disgusting appearance when alive, it is a very delicate fish for the table. It is extremely voracious.

THE SEA LOACH.

THIS is termed the whistle-fish in Cornwall. It is from nine to twelve inches in length, and the head is large and flat. Its mouth resembles that of an eel, furnished with numerous small teeth, disposed along the jaws in the form of a broad plate; it has also a set of small teeth, disposed in a triangular form, in the roof of the mouth. The eyes are near the end of the

the snout, and their iris is of a silver-colour. The scales are very small, and the head, back, and sides, are variegated with large spots of a darkish red. In a dent or furrow near the middle of the back, instead of a fin, there is a low membrane, or skin, edged with very small hairs; by which it may be distinguished from all other fish of this kind. It varies greatly with regard to the spots; sometimes they are red, sometimes white, and sometimes it has no spots. The colour of the head and body are of a reddish yellow, but the sides are lighter, and the belly almost white. This species usually frequents the rocky shores of these islands, and is sometimes taken with a bait.

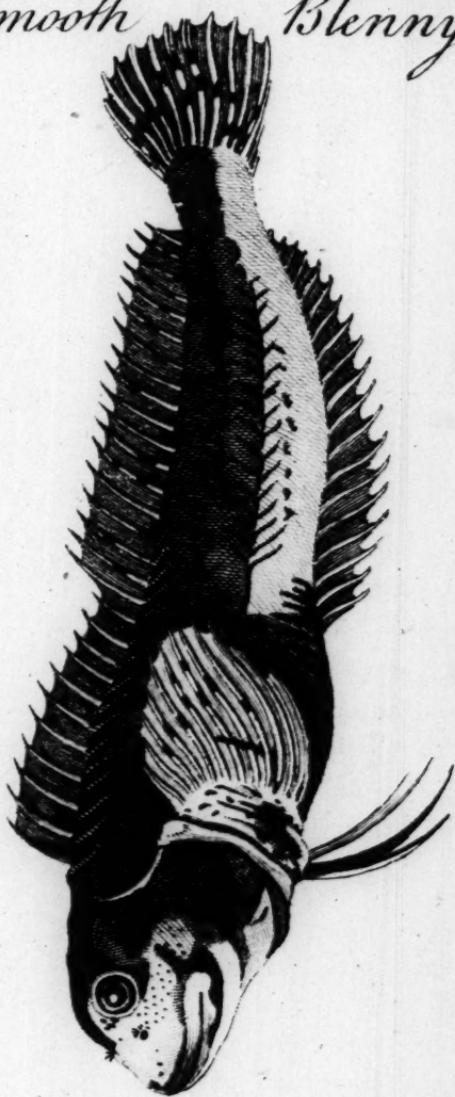
THE SMOOTH BLENNY.

THE length of this fish is about five or six inches; the head is large, and sloping suddenly to the mouth; the iris is red; the teeth are sharp, slender, and close set; it has twenty-four in the upper, and nineteen in the lower jaw. The tail consists of twelve branched rays, and is rounded at the end. Some of these are black, others of a deep olive colour, marbled with a deeper tint, and others are spotted with white. This fish is very tenacious of life, and will live almost a whole day out of water. It feeds on shells, and small crabs.

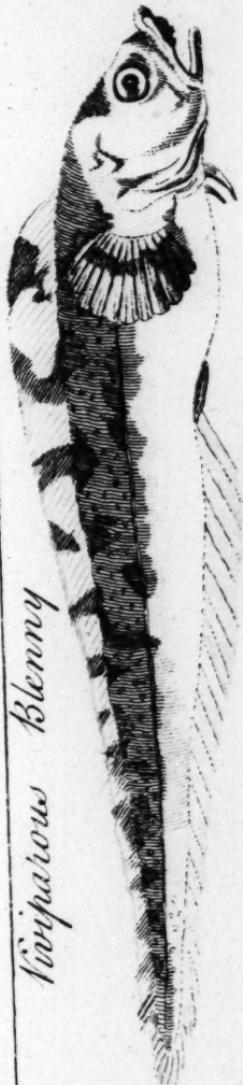
THE SPOTTED BLENNY.

THIS species, and the smooth blenny, are found in great plenty, lying under the stones among

Smooth Blenny



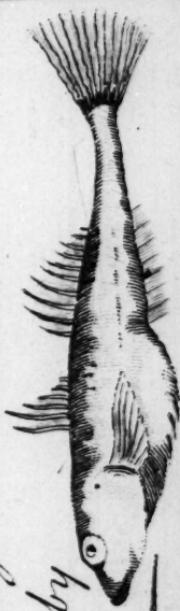




Viviparous blenny



Spotted blenny



Spotted Goby





among the tang, on the rocky coasts of Anglesea, at the lower water-mark, and is used as a bait for larger fish. It is about six inches in length, and half an inch in depth ; the fides are very much compressed, and extremely thin ; the mouth is small, and the iris of the eye whitish. The pectoral fins are of a yellow colour and rounded ; and, instead of the ventral fins, there are two minute spines. The back and fides are of a deep olive colour, and the belly is whitish ; the tail is rounded, and of a yellow colour.

THE VIVIPAROUS BLENNY.

THIS species is generally about a foot in length, and of an eel-like form ; the skin is smooth and slippery. The back and head are of a yellowish brown, stained with black strokes : the fides are a little lighter, and the belly of a dirty white. It has two small beards at the nostrils ; the jaws are rough, and the covers of the gills are open. It brings forth two or three hundred young at a time, and their season for parturition is a little after the depth of winter. Before Midsummer they quit the bays and shores, and retire into the deep, where they are usually taken. They are a coarse fish, and but little esteemed as food.

THE BULL-HEAD, OR MILLER's THUMB.

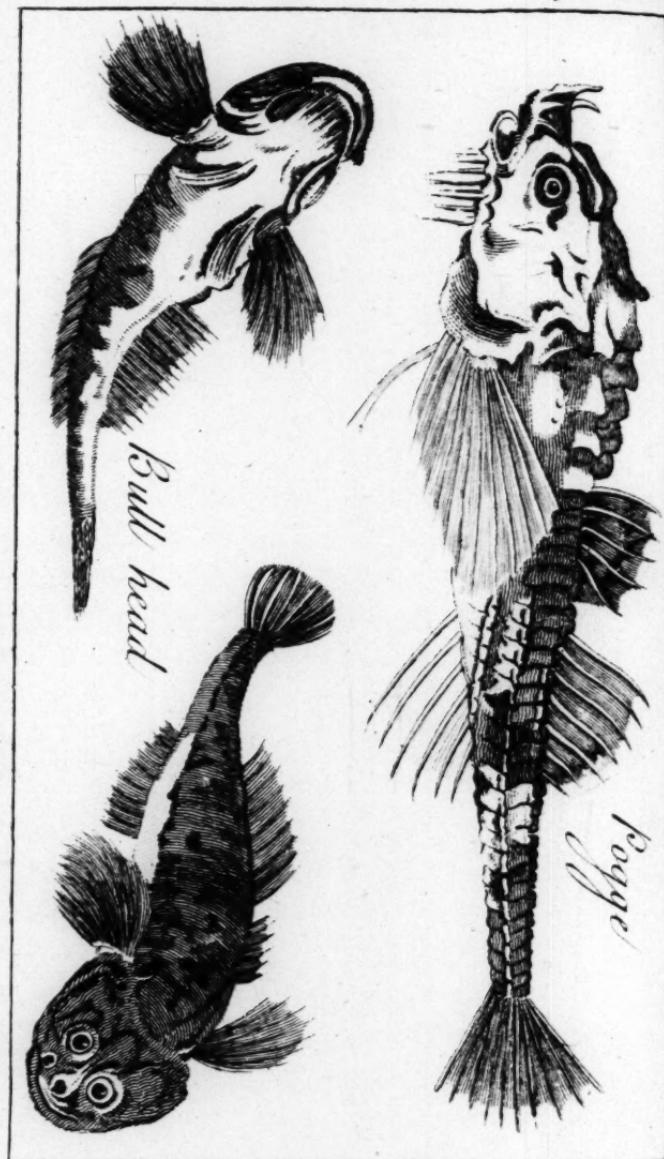
THIS species is very common in all our clear brooks ; it is about four or five inches in length, with a large broad depressed head of a roundish

roundish shape. The gill fins are round, and notched on the circumference. The eyes are small; the iris of the eye is yellow: the teeth are very minute, and placed in the jaws and the roof of the mouth. The body grows slender towards the tail, and is very smooth. At the beginning of the cover of the gills, on each side, there is a crooked prickle. The colour of this fish is as disagreeable as its form; being dusky, mixed with a dirty yellow: the belly is whitish. It usually lies at the bottom of a stream, either on the gravel, or under a stone; it forms a hole in the gravel, where it deposits its spawn, and quits it with great reluctance. It feeds on water insects.

THE POGGE.

THIS fish seldom exceeds five inches and an half in length, and very seldom arrives even at that size: it has a triangular depressed head, which is about two inches broad, and very bony and rugged. The end of the nose is armed with four short upright spines, and on the throat are a number of short white beards. The teeth are very minute, and situated in the jaws. The body, which is octagonal, is covered with a number of strong bony crusts, divided into several compartments; the ends of which project into a sharp point. It is covered all over with bony scales, in the middle of each of which there is a hooked tubercle, which makes the fish appear full of angles. The pogge is very common on most of the British coasts.





THE FATHER LASHER.

THIS is also called the sea-scorpion : it abounds in the Newfoundland seas, but it is no uncommon fish on the rocky coasts of this island : it lurks under stones, and will take a bait. It seldom exceeds eight or nine inches in length, and its form resembles that of a bull-head.

THE DOREE, OR GILT FISH.

IT has a broad compressed body, not much unlike that of a flounder ; but it swims erect. The head is very large and compressed, and the mouth is extremely wide. The colour of the sides is olive, with a large round black spot on each ; by which it may be distinguished from other fish of this kind. In short, the form of this fish is hideous ; the body is oval, the eyes large, and the irides yellow. They never grow to a great size ; one of the weight of twelve pounds being considered as a very large fish. It is called the doree, or gilt fish, on account of its shining appearance when alive.

This fish is found not only in the southern seas of this kingdom, but also on the coast of Anglesea. Those of the largest size are taken on the Bay of Biscay, off the French coasts : they are also very common in the Mediterranean.

THE HOLLIBUT.

THIS is the largest of all flat-fish in these parts of the world ; it greatly exceeds a turbot

in size, and is of a longer make. Some have been taken in our seas, weighing from one to three hundred pounds. In the seas of Newfoundland, Greenland, and Iceland, they are found much larger.

The hollibut, with respect to its length, is the narrowest of any of this genus, except the sole. It is perfectly smooth and free from spines, either above or below. The colour of the upper part is dusky, that of the lower part of a pure white. The eyes are placed on the right side, or to the left of the mouth; the fins are at a greater distance from the head than in other flat fish. In both the upper and the lower jaws it has a double row of teeth, which are very sharp, and somewhat crooked at the end. It has very sharp prickles on the gills, and swims sideways.

Of all flat fish the hollibut is the most voracious. They are common in the London markets, where they are exposed to sale cut into large pieces. They are by some supposed equal to the turbot, but in general they are thought very coarse eating; excepting the part which adheres to the side fins, which is extremely delicious.

THE PLAISE.

THE back of this fish is of a dirty olive colour, or brown, and speckled with roundish red spots, of which there are some also on the fins. The belly is white. The eyes are on the right side, to the left of the mouth; and, at the upper edge of the coverings of the gills, there

there are seven bony tubercles, or warts ; the fifth from the eyes being the highest and the largest. There is a row of teeth in each jaw, and a cluster of teeth on the palate. One of the nostrils is seated on the upper side, near the eyes ; and the other on the lower side, under the eyes. The tail is long, and roundish at the end.

These fish are very flat. They are common on most of our coasts, and are sometimes taken of the weight of fifteen or sixteen pounds ; but they are very rarely found of that size, one of seven or eight pounds being reckoned a large fish. The largest are taken off Rye, on the coast of Sussex, and also off the Dutch coasts.

THE DAB.

THIS fish is somewhat thicker than the plaice, but smaller. It is found with the other species, but is less common. The scales are small and rough on the edges, in which it differs from the plaice, as well as in not having any tubercles near the head, nor red spots : but the eyes are situated like those of the plaice, and the colour on the upper part is of a dirty olive, with a reddish cast, and some spots of a dusky yellow. The mouth is of a middle size, and has a row of teeth in each jaw. The lateral line is very crooked at the beginning, but afterwards goes quite straight to the tail. The lower part of the body is white. This fish is best in season during the months of February, March, and April, and is superior in goodness to both the plaice and flounder.

THE FLOUNDER.

THE flounder is easily distinguished from the plaife, or any other fish of this genus, by a row of sharp small spines or prickles that surrounds its upper sides, and are placed just at the junction of the fins with the body. Another row marks the side-line, and runs half-way down the back. The scales, which are exceeding small, stick so close to the skin, that there seems to be no roughness. This fish has a small mouth, a narrow tongue, and a row of teeth in each jaw. It greatly resembles the plaife in shape, but the body is somewhat longer and thicker. It inhabits every part of the British sea, and even frequents our rivers which communicate with the sea; and though it does not grow large in our fresh-water streams, it is reckoned sweeter than those which live in the ocean. It does not grow so large as the plaife, and is hardly ever seen to exceed six pounds in weight. The colour of the upper part of the body is a pale brown, and frequently marked with a few obscure spots of dirty yellow; the belly is white.

Flounders are in season all the year, except in June and July. The flesh is white, soft, innocent, and nourishing; but is always best when it is most firm. The taste of it greatly resembles that of the plaife, from which it differs but little in any respect.

THE SOLE.

THIS is a long flat fish, resembling the sole

of

of a shoe in shape, from whence it has its name. It is found on all our coasts, but those on the western shores are much superior in size to those of the north. On the western coasts they are sometimes taken of the weight of five or six pounds, but towards Scarborough they seldom exceed one pound, and one of two pounds is reckoned an uncommon fish. The upper part is of a dark ash colour, and the lower part white; it is covered with rough scales. The lateral line passes directly from the head to the tail, through the middle of both sides. The corners of the mouth are rough, having a kind of small bristles or hairs: the body is surrounded with short fins, which begin near the eyes, and extend almost to the tail. The eyes are small, round, and covered with a loose skin; the irides are yellow, and the pupils of the eye are of a bright sappharine colour; the tail is rounded at the end.

The sole is a fish of a very delicate flavour, but the large soles are much inferior in goodness to the small ones. The chief fishery for them is at Brixham, and in Torbay.

THE TURBOT.

IN the northern part of England this fish is called a brett; it grows to a very large size, and sometimes, though very rarely, is found to weigh thirty pounds. It is the largest of all this kind, the halibut excepted. These fish are taken chiefly off the north coast of England, and others off the Dutch coast; but we believe the last has, in many instances, more

credit than it deserves for the abundance of its fish. They have no scales, but a rough spotted skin, full of exceeding small prickles, placed without order on the upper part of the body.

THE PEARL.

THIS differs from others of this kind, in having a scaly body, and from a plaise in the prickles which surround the roots of the fins. The upper part of the body is of a deep brown, marked with spots of dirty yellow; the lower part is of a pure white. Its eyes are on the left side, to the right of the mouth, and are at a greater distance from each other than those of the plaise. These fish are frequently brought to the London markets, but they are smaller than the turbot, and inferior in goodness.

THE WRASSE, OR OLD WIFE,

IN shape resembles the river tench; it grows to the weight of four or five pounds, and is covered with large scales. These fish vary infinitely in colour, but in general are reddish, and most beautifully striped, especially about the head, with the richest colours, such as red, blue, and yellow. This species is found in deep water, adjacent to the rocks, and is to be met with in the British and Irish seas. It is more agreeable to the sight than to the taste. The Welch call it gurach, or the *old woman*; the French call it *la vieille*, or the *old woman*; and the English give it the name of *old wife*.

It





It is difficult to assign a reason why they all so exactly agree in these synonims.

THE COOK.

THIS is a scaly fish, and does not grow to any great size. The back is purple and dark blue, and the belly yellow. They are sometimes taken in great plenty on the Cornish coasts.

[The Reader is here presented with an accurate representation of the BALLAN, but we have not been able to obtain any account of the colour of that fish; we can therefore only give the figure of it. Mr. Pennant classes it with the WRASSE. It appears to be a species between the COOK and the PEARCH.]

THE PEARCH.

THE pearch was much esteemed by the Romans, and is now equally admired as a firm and delicate fish. It delights in deep holes and gentle streams, is extremely voracious, and a very eager biter: if an angler meets with a shoal of them, he is almost sure of taking every one. A full-grown pearch is about twelve or fourteen inches long, though they are sometimes found to exceed sixteen; but this is an extraordinary size. The body is deep, the scales very rough, and the back very much arched. The iris of the eye is of a yellow or gold colour, the mouth is wide, and the teeth are small, disposed in the jaws and on the roof of the mouth; the edges of the covers of the gills are serrated, and on the lower end of the largest

largest is a sharp spine. The colours of the perch are beautiful; the back and part of the sides are of a dark green, marked with five broad black bars, pointing downwards; the belly is white, tinged with red; the ventral fins are of a bright scarlet, and the anal fins and the tail are of the same colour, but somewhat paler. The tail is a little forked.

It is said, that the pike will not attack this fish, being fearful of the spiny fins which the perch erects at the approach of the former. With respect to large fish, this opinion may be well founded; but it is well known the small ones are the most alluring bait that can be offered for the pike; it is probable the fins are then too soft to do him any injury.

The perch is very tenacious of life, and may be carried forty or fifty miles in dry straw, and yet survive the journey. The flesh of it is very wholesome and easy of digestion.

THE BASS

IS a strong, active, and voracious fish. It is frequently called the wolf-fish, on account of its voracity; will grow to the weight of fifteen pounds, and its shape resembles that of a trout, except that it has a thicker head. It is esteemed a very delicate fish, and extremely wholesome; is an inhabitant of the sea, and has never been found in our fresh-water streams.

THE RUFF

IS a river fish, and resembles the perch, but is slenderer and smaller, seldom exceeding six inches

inches in length: the body is covered with rough compact scales, from whence it has its English name. The back and sides are of a dirty green, the latter inclining to yellow; but both spotted with black. About the covers of the gills it is of a shining gold colour, whence it is sometimes called the gilded perch.

THE STICKLEBACK.

THESE are common in many of our rivers, and are found in vast quantities in the fens of Lincolnshire, and some of the rivers that creep out of them. This fish has only one fin on the back, with three distinct spines or prickles placed before it, which it can raise or depress at pleasure; the eyes are large, the belly prominent. The mouth is furnished with very small teeth, and the upper jaw is somewhat longer than the lower. The tail consists of twelve rays, and is even at the end. The colour of the back and sides is an olive green, and that of the belly is white.

THE MACKREL.

THE mackrel was greatly esteemed by the Romans, because it furnished the precious *garum*, a kind of pickle that gave a high relish to their sauces. It is a summer fish of passage that visits the British coasts in immense shoals. It is usually from a foot to a foot and a half in length, and seldom exceeds two pounds in weight. The body is long, thick, and *fleshy*, but very small and slender towards the tail. It is not entirely destitute of scales, but what it has

has are extremely thin and small. The colour of the back and sides is a fine green, varied with blue, marked with black lines pointing downwards; beneath the line the sides and belly are of a silvery colour: the tail is broad and forked, and appears to be almost separated into two distinct fins. The nose is taper and sharp-pointed; the jaws are of an equal length, and furnished with teeth, which are small and numerous; the eyes are large, the tongue sharp, and the nostrils small and round. It is a fish of prey. When just taken, the flesh of a mackerel is delicate food, and it is esteemed even after it is brought up to London. Those who have tasted mackerel perfectly fresh, know how much they are superior to those which have been taken two or three days. It is nourishing food, and reckoned to be of a dissolving nature; but is heating, and not reckoned wholesome, producing viscous and gross juices, and is not easy of digestion.

Mackerel are found in large shoals in many parts of the ocean, but especially on the coasts of France and England.

THE TUNNY.

THIS is also called the Spanish mackerel. The form of the tunny, however, is less elegant than that of the mackerel, being rather thicker in the middle. The colour of the upper part of the body is dusky, varied with blue and green, and the sides and belly are silvery. They grow to a large size, sometimes being found of upwards of a hundred weight. They are





are fish of passage, and ramble from one part of the sea to another, at a considerable distance. They are not common in our seas, but are sometimes taken on the coast of Cornwall, with their stomachs full of pilchards. The flesh of the tunny, though not very delicate, is said to be tolerable food when properly cooked.

THE S C A D.

THIS is called the horse-mackrel by the inhabitants of London ; it resembles the common mackrel in colour, shape, and flavour, but is smaller and the body thinner. It is taken on the coast of Cornwall, and many other places.

THE P I P E R.

THE colour of the back and tail of this fish is of a deep grey, covered with small scales, and spotted with yellow or white ; it has a yellowish head. The snout is divided into two broad horns, each terminated with three spines or prickles. The spines on the back are larger and longer than those in other fish of this kind. The nostrils are very minute ; the eyes large ; the lower jaw much shorter than the upper ; and the teeth very minute in both. This fish is found in the western coast at all seasons of the year, and is esteemed a great delicacy. It is called the piper, from the noise it makes. They are often seen to weigh three or four pounds, and to measure from twenty to twenty-four inches.

THE

THE LOACH.

THIS is also called the *groundling*; it is found in several of our brooks or small rivers, where it usually keeps at the bottom on the gravel, whence it owes its second name. It is frequent on the stream near Amesbury in Wiltshire, where the sportsmen swallow it down alive in a glass of white wine, and suppose it an excellent remedy in consumptive cases. In shape and colour it resembles a gudgeon, but is smaller and shorter: the flesh is extremely tender and delicate.

THE SALMON.

THE salmon is a beautiful fish; the body is longish, covered with small thin scales; the head is small in proportion to the body, and has a sharp snout: the tail is forked. The back is of a bluish colour, and the other parts are generally white, intermixed with blackish or reddish spots, placed in a very agreeable manner.

The teeth are small in proportion to its body, and the gills are quadruple, with a broad cover full of red spots. The flesh, when fresh killed, is not so red as when it is boiled or salted: it is tender, luscious, flaky, and soon satisfies, and is generally preferred to that of other fish.

The salmon lives both in the fresh and salt waters, quitting the sea at certain seasons, in order to deposit its spawn in security, in the gravelly beds of rivers remote from their mouths.

mouths. It lives several years, and may be kept a long time out of the water before it dies.

The SMELETS, or fry of salmon, leave the Mersey about May or June, and then weigh about two ounces a piece: they return about August or September, and weigh from one pound and an half to two pounds. Their greatest magnitude is much the same in most parts of Europe, and when they are largest, they weigh from thirty-six to fifty-four pounds.

There is nothing relative to this fish, which has been more talked of than its agility in leaping over the obstructions which oppose its passage either to or from the sea, for they are frequently seen to throw themselves up cataracts and precipices many yards high. They sometimes make several essays before they can gain their point, and when they have done it, it has been often to their own destruction, for they have leapt into baskets placed on purpose to catch them. There is a remarkable cataract on the river Tivy, in *Dembrokeshire*, where people often stand wondering at the strength and agility which they exercise to get out of the sea into the river; on which account it is known in those parts by the name of the salmon-leap. On the river Wear, near the city of Durham, there is another of this kind, which is supposed to be the best in England.

The chief rivers in England that yield this excellent fish, are the *Thames*, *Severn*, *Mersey*, *Trent*, *Medway*, *Dee*, *Ex*, *Usk*, *Wye*, *Lon*, *Tyne*, *Werkington*, *Weaver*, &c. Our

London markets, however, are supplied soonest from the north, where they are not only more plentiful, but are in season before those of the southern rivers.

THE SALMON TROUT.

THIS fish is also called the bull trout, from the thickness and shortness of its head. It differs from the salmon in having the tail less forked, and seldom exceeds twenty inches in length. Its flesh is white, and less delicate than that of the salmon.

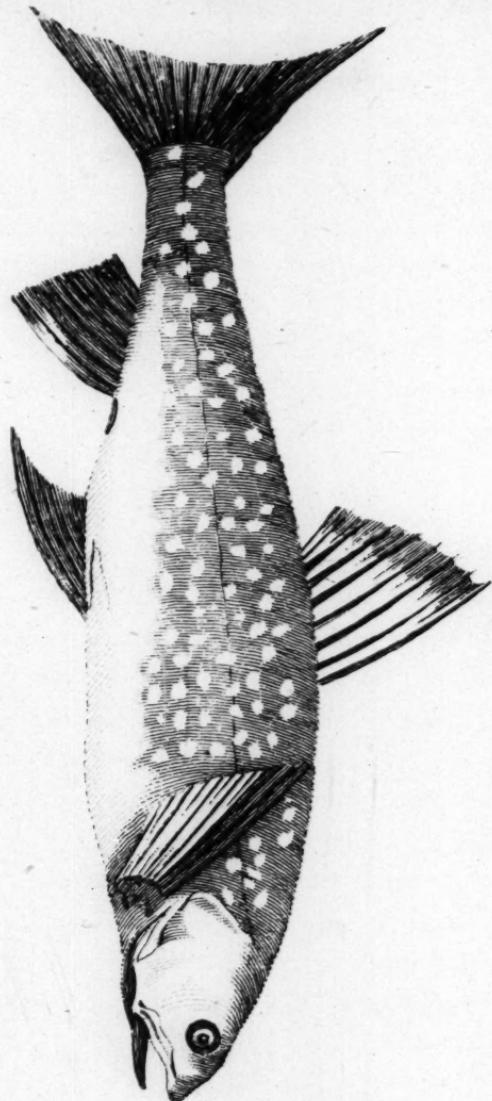
These fish delight to lie in deep holes, and usually shelter themselves under the root of a tree.

THE TROUT.

THE trout is a fish of excellent taste, and is covered with small scales, usually streaked with red. There are several species of this fish, which live in various places, and differ in colour and size. Some are found in deep and rapid rivers, others in lakes; some are of a blackish colour, others reddish, and rather of a gold colour, and variously marked with spots of a purple or vermillion tye, but on the belly they have a yellowish cast.

This fish swims with much agility and swiftness, and is said on hearing thunder to be so astonished, as to become immovable. It feeds upon worms, slime, mud, insects, and small fishes, which it pursues with so much eagerness, from the bottom to the surface of the water,





water, that it sometimes throws itself into the boats passing near it.

Trouts, beside being well tasted, produce good juices, because they are always in motion, feed upon good food, and usually swim in clear and running streams ; but they soon putrefy and corrupt, and therefore should be eaten soon after they are brought out of the water.

The trout is of a longish form, and resembles the salmon more than any other fish.

THE CHARR, OR RED CHARR.

THE charr is an inhabitant of the lakes of the north, and of those of the mountainous parts of Europe. The body is longer and more slender than that of the trout, and the back is of an olive colour, speckled with whitish spots. In general the belly is red, though it is sometimes white, especially in the spawners : the scales are very small, and the lateral lines straight : the mouth is wide, and the jaws are nearly equal : the lower part of the fins are of a vermillion die, and the gills are quadruple. The charr has teeth both in the jaws and on the tongue ; and in the upper jaw it has a double row. The flesh is softer and more tender than that of the trout. The charr is in very high esteem, and exceeding scarce. The inhabitants in the neighbourhood of Winander-mere make a practice of potting charrs, which are usually sent as presents to remote friends ; but they cannot be taken in sufficient quantities for sale even at an unreasonable price.

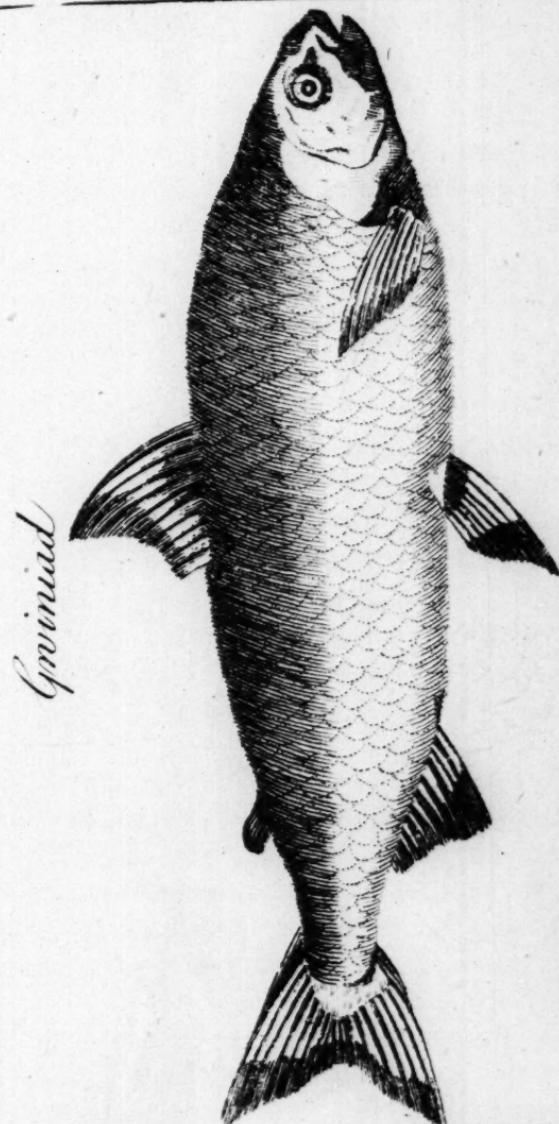
THE GRAYLING, OR UMBRA.

THIS is a voracious fish, and takes a bait very eagerly. It swims rapidly, and disappears like the transient passage of a shadow, from whence it probably derived the name of umbra. It is of an elegant form, the body longer and flatter than that of a trout, and seldom exceeds eighteen inches in length. The head is dusky; the covers of the gills of a glossy green; the back and sides of a fine silvery gray, from whence it has its name of grayling, though they seem to glitter with spangles of gold, and are marked with black spots irregularly placed.

The grayling haunts clear and rapid streams, particularly those that flow through mountainous countries. It is a firm, good, and wholesome fish, and may be eaten all the year, but is in the highest season in December.

THE SMELT.

SMELTS are usually about six inches long, and near an inch in breadth, but they are sometimes found of the length of twelve inches; they have a very peculiar scent, from whence their English name is derived—*smelt*, that is, *smell it*. People greatly disagree respecting the scent of this fish; some assert it flavours of the violet, others of the cucumber; we acknowledge that we are of the latter opinion. The Germans, however, distinguish it by the delicate title of *stinck-fish*. The smelt is of a very beautiful form and colour: the head





head is so transparent, that all the lobes of the brain may be plainly and distinctly seen ; and the skin in general is so thin, that with a good microscope, the blood may be observed to circulate. The scales are small, and fall off with the slightest touch : the back is of a dusky colour, but the belly and sides shine like silver : the tail consists of nineteen rays, and is forked : the iris of the eye is silvery, the pupil of a full black, and the under jaw is the longest : it has four large teeth in the front of the upper jaw, and several small ones in the sides of both : it has two rows of teeth in the roof of the mouth, and two others of large teeth on the tongue.

Smelts inhabit the seas that wash the islands of Great Britain and Ireland the whole year, and never go very remote from shore, except when they ascend the rivers. The flesh is soft and tender, and of a delicate taste, and is therefore very high in esteem. They are frequently served up to table as a kind of garnish to large fish.

THE GUINIAD.

THE guiniad is an inhabitant of several of the lakes of the Alpine parts of Europe. It is also found in Scotland, Ireland, and Wales, particularly in Pemble-meer, a lake in Merionethshire. The shape of this fish is not much unlike that of the salmon, the usual length is about twelve or thirteen inches, and its greatest depth about three inches. The British word guiniad, which signifies *whiting*, was given it

on account of the whiteness of its body: they are in season in the summer, and though the fish is white, it has the flavour of that of the trout; it is, however, much higher in esteem, because it is a greater rarity.

THE PIKE.

THE pike has a roundish oblong body, with a flat head, and square back: the snout is very prominent, and the lower jaw is somewhat longer than the upper. The mouth is very wide, and the teeth are very sharp, disposed only in the front in the upper jaw; but in both sides of the lower jaw, in the roof of the mouth, and sometimes on the tongue: the eyes are small, and the tail is forked. The body is covered with small thick scales, which are moistened on the edges with a kind of slime that has a greenish cast; and the younger the fish is, the greener he appears. The back and sides, when turned towards the light, appear to have somewhat of a golden hue: the sides are spotted with yellow, and the belly is white. It has dusky spots, and reddish lines on the tail, especially towards the corners.

The pike will swallow other fish which are almost as large as itself; not even excepting those of their own kind. Innumerable are the instances mentioned by authors of the voracity of this fish. It will devour the water-rat, and draw down the young ducks as they are swimming on the water. At Lord Gower's canal at Trentham, a pike seized the head of a swan, as it was feeding under water, and gorged so much

much of it as killed them both. *Gesner*, indeed, tells us, that a famished pike on the Rhine seized on the lips of a mule that was brought to water, and that the beast drew the fish out before it could disengage itself.

The longevity of the pike is very remarkable. *Rzaczynski*, in his *Natural History of Poland*, tells us of one that was ninety years of age; and *Gesner* says, that in 1497 a pike was taken near Hailbrun, in Suabia, with a brazen ring affixed to it, on which were the following words in Greek characters: "I am the fish which was first of all put into this lake by the hands of the governor of the universe, Frederick the second, the 5th of October, 1230." Supposing this to be a fact, the fish was at least two hundred and sixty-seven years of age.

Their usual time of spawning is in March, and sometimes sooner if the spring is forward: they are exceedingly prolific, forty-eight thousand eggs having been found in one of their roes. They are in season all the year, except in spawning time, and about six weeks after it. The pike is good and nourishing food, and agrees at all times, but especially in winter, with any age and constitution: the flesh is firm, white, and sweet; but if the fish exceeds ten or twelve pounds in weight, it has a rankish flavour. The roe provokes vomiting, and sometimes purges violently. The pike contains much oil and volatile salt.

Mr. Lee, of Thelwell in Cheshire, had stored a pit, but when he laded it, in expectation

tion of catching a great number of fish, to his disappointment he found only a large lean pike, which had devoured all the store-fish, and had in his stomach a water-wagtail, and a young thrortle, which were supposed to have been hopping on a twig near the water.

A pike catched in Barn-meer (a large standing wafer in Cheshire) was an ell long, and weighed thirty-five pounds; it was presented to Lord Cholmondeley, who ordered it to be put into a canal in the garden, wherein were abundance of several sorts of fish. About twelve months after, his Lordship drawed the canal, and found that this overgrown pike had devoured all the fish, except one large carp, that weighed between nine and ten pounds, and that was bitten in several places. The pike was then put into the canal again, together with abundance of fish with him to feed upon, all which he devoured in less than a year's time, and was observed by the gardener and workmen there to take the ducks, and other water-fowl, under water; whereupon they shot magpies and crows, and threw them into the canal, which the pike took before their eyes: of this they acquainted Lord Cholmondeley, who thereupon ordered the slaughter-men to fling in calves bellies, chickens guts, and such like garbage to him to prey upon, but being soon after neglected, he died, as supposed, for want of food.

In the stew for preserving fish, at John Egerton's, Esq. at Tatton, in Cheshire, a large pike was taken out, when there appeared at his

mouth

mouth the tail of a fish, which being pulled out, proved to be another pike, weight one pound, and was then alive.

In 1730, while Peter Bold, of Bold, in Lancashire, was netting some pits in Burton-wood, he saw a pike lying amongst the weeds. Mr. Ralph Taylor, a gentleman who accompanied him, twice attempted to seize the pike, but it escaped. Afterwards the pit was drawn, and a tench about five pounds weight pulled out; and so was this pike, with the tail of another hanging out of its mouth, which being measured with the other, proved nearly of equal size.

About the year 1740, when Robert Hyde, of Cofnal, Esq. came of age, he had a large company of gentlemen to dine with him, to whom a fisherman brought three pikes, one of twenty-three pounds, another of twelve pounds, and a third of four pounds, which he had caught by trolling in the Weaver: that of twelve pounds appeared in many places to have been bit, which he thus accounted for. While he was drawing the fish to land, it was laid hold of by a larger pike, which stuck fast, and was landed, but then quitted his hold and got away.

The pike delights in a quiet, shady, unfrequented water, and lurks in the midst of weeds, flags, or bull-rushes; yet he frequently makes excursions from thence, and ranges about in search of prey; in cold weather he lies deep, and near the bottom, but as the weather grows warm, he frequents the shallows. In a very hot,

hot, clear, sultry day, he may be seen lying on the surface of the water, but cannot then be tempted with any bait.

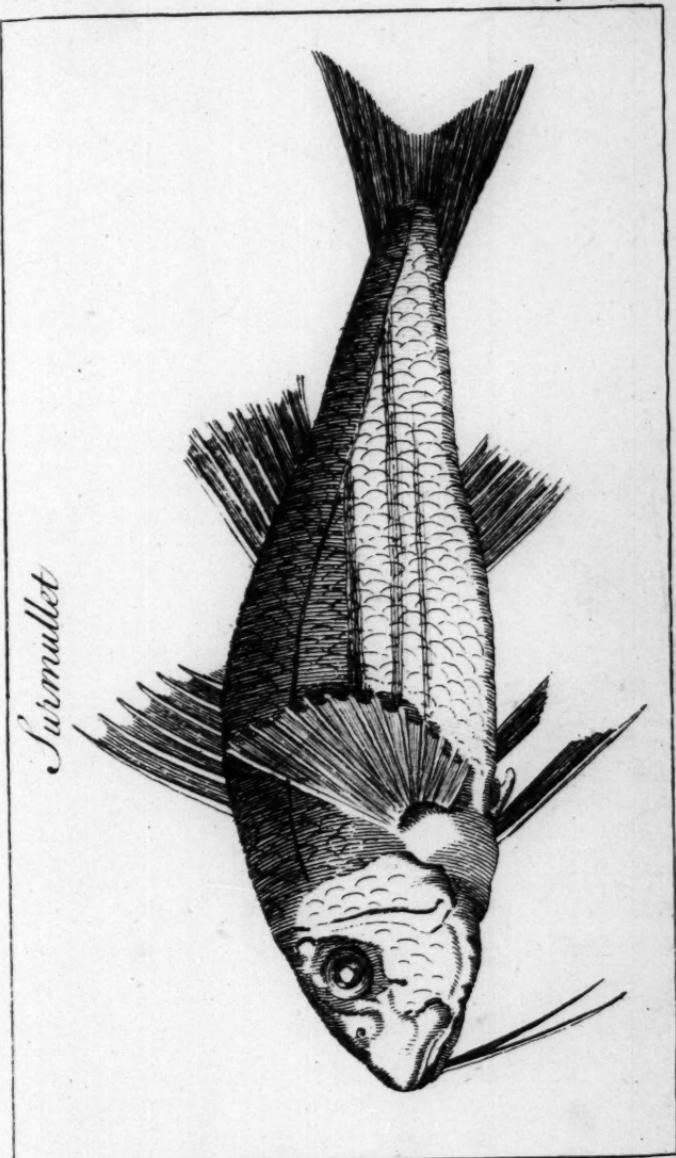
THE SEA PIKE.

THIS fish is also known by the name of the sea-needle : its form resembles that of the river pike, but is proportionably longer and rounder. The sea-pike is an inhabitant of the Mediterranean.

THE MULLETT.

THE form of a mullet resembles that of a dace : the head is almost square, and flat at the top ; the nose is sharp, and the lips thick. It has large scales, not only on the body, but also on the head, and covers of the gills. The back is of a bluish brown, and the belly white. This fish has a bone beset with prickles at each corner of the mouth : when at its full growth, it is about eighteen inches long. It visits the rivers in the southern parts of England, in the beginning of the summer with every tide, and returns back when the water ebbs. Those taken near Arundel, in Sussex, are said to be much superior to any others. The mullet is an excellent fish for the table ; it was in great estimation among the Romans, and bore an exceeding high price. The price given for one in the days of Juvenal and Pliny, is a striking evidence of the luxury and extravagance of that age :

The



Surmullet



The lavish slave
Six thousand pieces for a mullet gave,
A farthing for each pound. DRYDEN'S JUV.

Afinus Celer, however, a man of consular dignity, was infinitely more lavish than the epicure mentioned by Juvenal; for (as Pliny tells us) he gave eight thousand mummi, or sixty-four pounds eleven shillings and eightpence, for a fish of so small a size as the mullet. Such, indeed, was the luxury of the times, that, as we are informed by Seneca, there were stews in the eating-rooms, so that the fish could at once be brought from under the table and placed upon it; they even put the mullets in transparent vases, that they might be entertained with the various changes of its colour while it lay expiring.

THE FLYING-FISH.

IN shape and colour the flying-fish nearly resembles that of a herring, but the eyes are larger in proportion. It has two pair of fins like wings; the greater of which are placed a little behind the gills, and the lesser about the region of the vent. The wings before are preceded with a small fin of six rays, and the upper part of the wings is of a dirty olive colour; but on the edge they are beautifully painted with round blue spots. By the help of these wings they arise out of the water, and fly a considerable way, to avoid the pursuit of the *dolphins* and other fishes that would devour them. Some authors say, that they will fly for 200 paces together, and fall down when their fins grow dry;

in

in their flight they go sometimes on one side, sometimes on the other, and are often taken while flying by sea-mews or cormorants. They are never taken by fishing for them; but will often fly into the ships that sail between the tropics. The flesh of them has a very agreeable flavour, and is very wholesome.

THE HERRING.

HERRINGS differ greatly in size, but the usual length is from nine inches to a foot. The colour of the back and sides is green, varied with blue, and the belly is silvery. What principally distinguishes this fish from all others is a scaly line that runs along the belly from the head to the tail. The scales are large, thin, and fall off with a slight touch. It has no spots, and the belly is sharp like a wedge. The eyes are very large; the edges of the upper jaw and the tongue are very rough, but the whole mouth is void of teeth: the gill-covers are very loose, and open wide, which occasions the immediate death of the fish when taken out of the water; whence the proverb arises, *as dead as a herring*. The tail is forked, and the swimming-bladder is of a silver colour. The flesh of the herring is in great esteem, being fat, soft, and delicate; especially if it is dressed soon after it is taken.

Herrings begin to appear off the Shetland Isles in April and May; but the grand shoal make their appearance in June. Their number is so immense as to alter the appearance of the very ocean. They are divided into distinct columns

columns of five or six miles in length, and three or four in breadth, and they drive the water before them with a kind of rippling: sometimes they sink for a few minutes, then rise again to the surface, and in fine weather reflect a variety of splendid colours. Toward the end of June, herrings are in full row, and they continue in perfection till the beginning of winter.

The herring fishery is of great antiquity: the Dutch first engaged in it about the year 1164: their diligence and skill gives them a superiority over us in that branch of trade even at this day; it is nevertheless a considerable article among the English. Yarmouth has long been famous for its herring fair, which was regulated by an act in the 31st of Edward the Third: and that town is obliged, by its charter, to send to the sheriffs of Norwich 100 herrings, to be made into twenty-four pies, by them to be delivered to the lord of the manor of East Carleton, who is to convey them to the king.

Immense quantities of these fish are annually taken, many of which are consumed while they are fresh, and the rest are salted, pickled, or smoke-dried, and are an edible article all over Europe. Fresh herrings, considered as a food, are said to be very good aliment if used moderately; yet, taken in quantities disproportioned to the powers of digestion, they produce a putrefaction in the stomach of the alkaline kind, and are attended with very bad consequences. But pickled herrings are very bad aliment, the flesh being rendered hard, and scarcely digestible by the vital powers. They,

THE SPRAT.

however, are less injurious than those which are salted and dried ; these last being more hardened, and consequently less easily digested.

THE PILCHARD.

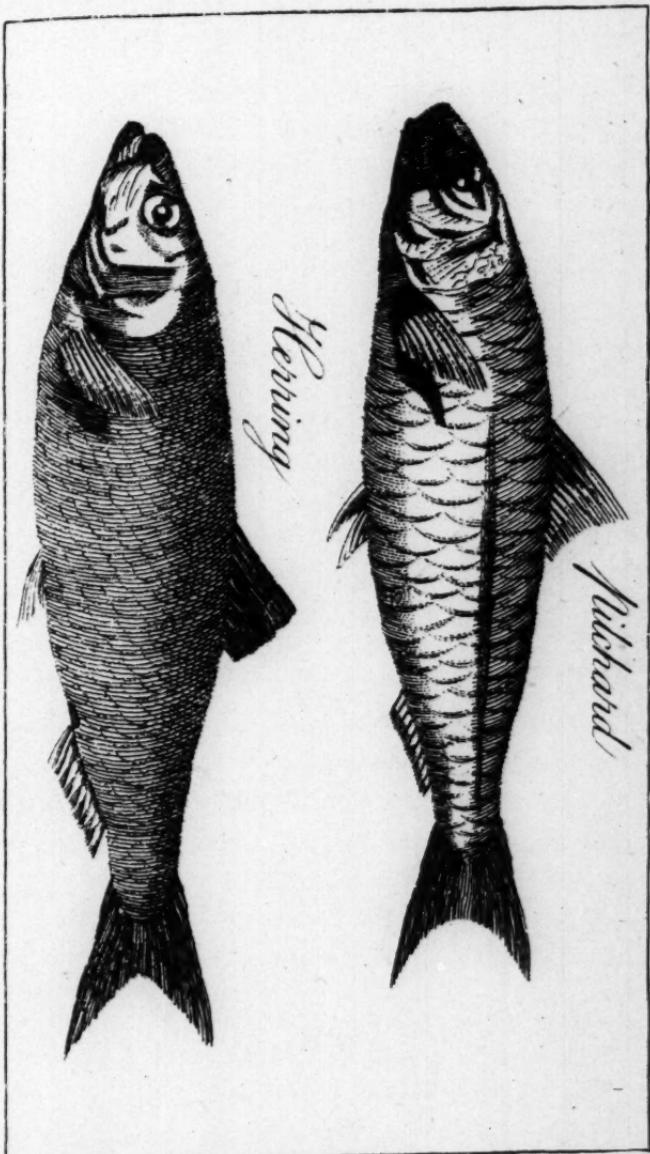
THE pilchard greatly resembles the herring, but differs from it in some particulars ; it is a third part less, and the body is proportionably broader : it has a black spot near the upper corner of the gills, and the belly is not so sharp. It has no teeth, either in the jaws, the tongue, or the palate.

Pilchards appear in vast shoals off the Cornish coasts about the middle of July, and disappear at the beginning of winter ; though a few of them sometimes return again after Christmas. This fishery employs a great number of men, women, and children, in catching, salting, pressing, washing, and cleaning them ; and in making boats, nets, ropes, and casks.

THE SPRAT.

IT was supposed by Mr. Willoughby and Mr. Ray, that sprats were the fry of the herring or the pilchard, as they exactly resembled either the one or the other in every particular except the size : Mr. Pennant, however, is of a different opinion, and says, that on comparing a sprat and young herring of equal size, some specific differences were discovered. He also observes, that the sprats visit our coasts, and continue with us in shoals innumerable, when the young herrings have, in general, retired to the great northern deeps.

Sprats appear below bridge, in the river Thames, early in November, and leave it in the month



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month of March, and are, during that season, a great relief to the poor of the metropolis. The sprat seldom exceeds the length of five inches ; and the body is proportionably deeper than that of a herring.

THE ANCHOVY.

THE anchovy is about a palm in length, and almost of the colour of a sprat. The true anchovies are taken in vast quantities in the Mediterranean, and are brought over here pickled. The body is rounder, and not so compressed as that of the herring : they are also transparent, except where the spine of the back prevents it : they have a sharp nose, and the upper jaw is longer than the lower : the mouth is extremely wide in proportion to the size of the fish : the eyes, and the apertures of the gills, are also very large. The anchovy has this peculiar property, that it will dissolve in almost any liquor, when it is set over the fire.

THE SHAD.

THE shad differs from the herring in being broader, thinner, and more compressed on the sides : it is also larger than the herring, the general size being three or four pounds ; though they sometimes weigh seven or eight pounds. On each side, near the gills, it has a large round black spot, and six or seven small ones, placed in a right line towards the tail ; in which particular it agrees with the pilchard. The shad enters the mouths of rivers, which herrings never do. The Severn affords the shad

in higher perfection than any other river. This fish makes its first appearance in April and May, according to the temperature of the air: in very warm seasons it is always seen in April, and usually continues in the river about two months. The Severn shad is a very delicate fish about the time of its first appearance, especially in that part of the river near Gloucester. The Thames shad is reckoned a very coarse, insipid fish: it does not frequent that river till the month of July. There is indeed so great a difference between the Thames shad, and that of the Severn, that they can hardly be considered as the same fish.

THE CARP.

THE colour of the carp, especially when full grown, is yellowish, and the scales are large: the head is short, like that of the tench, and the mouth is of a middling size, with fat fleshy yellow lips. It has no teeth in the jaws or on the tongue, but it has a triangular bone in the palate, and two other bones in the throat, which answer the purpose of teeth. It has a single barb on each side of the mouth, and another above those which is shorter: the fins are large; the tail is broad, a little forked, and of a reddish black colour: the lateral line is straight, and passes through the middle of each side.

There were no carps in our ponds or rivers, till they were introduced here by Leonard Mafchal, about the year 1514. They are very long-lived. Gesner affirms, that he knew a man

man of good reputation, who assured him he had seen one of an hundred years old. They also grow to a very great size: a carp was taken in the river Thames, near Hampton-court, that weighed thirteen pounds. They are extremely tenacious of life, and have been kept alive out of water upwards of a fortnight, by being wrapped up in wet moss, with the mouth only remaining out. It should be hung up in a cool place, fed with bread and milk, and sometimes plunged into the water. By this treatment they grow fatter, and have a finer flavour than those which are immediately killed from the pond.

The carp is a prodigious breeder: the roe has sometimes been taken out and weighed with the fish itself, when the former has been found to preponderate. The carp has, perhaps, the longest scales of any fish, in proportion to its bulk. Some of these are brown, and others yellow and white: the brown colour prevails in the largest scales; the middle are of a yellow and gold colour; but the white are small and silvered.

THE BARBEL.

THE weight of the barbel is generally about seven or eight pounds: though they are sometimes found of the length of three feet, and eighteen or twenty pounds in weight. The back is of a palish olive colour, and the belly is silvery: the back and sides are marked with black spots; and the shape of the body is long and roundish; but the back is sharp and arched.

The scales are not large, and the lateral lines run through the middle of the sides. The snout is sharpish, and the mouth is without teeth like the rest of this kind. The upper jaw is longer than the lower, and it has two barbs on each side; one at the corner of the mouth, and the other on the side of the nose. The eyes are small, and the iris is either of a silver or a gold colour, spotted with brown. In summer their bellies are red. The flesh is soft, flabby, and extremely coarse: the barbel is indeed the worst and coarsest of fresh-water fish. The roe is very noxious, affecting those who eat of it with a nausea, vomiting, purging, and a slight swelling. In summer, these fish move about in the night in search of food; but in autumn and winter they confine themselves to the deepest holes. The barbel is bred in most rivers; and the Thames, in particular, abounds with them. The most famous places near London for barbel angling, are Kingston-bridge, and Shepperton-deeps; but Walton-deeps, Chertsey-bridge, the small isle at Brentford, Hampton-ferry, and the holes under Cooper's-hill, are thought to be in no wise inferior: we likewise meet with them at all the locks between Maidenhead and Oxford.

THE TENCH.

THE tench seldom exceeds four or five pounds in weight in this island, but in some countries it has been found to weigh twenty. It is sometimes called the physician of the fish, and it is said that the skin is so healing, that the wounded

wounded apply it as a styptic. Mr. Diaper, in his Piscatory Eclogues, says, that even the voracious pike will spare the tench on account of its healing powers.

The tench he spares, a medicinal kind ;
For when by wounds distract, or sore disease,
He courts the salutary fish for ease,
Close to his scales the kind physician glides,
And sweats a healing balsam from his sides.

It is a mucous, excrementitious fish, which delights in marshy and muddy waters. As to its medical uses, it is cut and applied to the wrists, and soles of the feet, in order to mitigate feverish heats, and to divert the venom of the pestilence ; in like manner is it applied in pains of the head and joints. Live tenches, applied one after another to the regions of the umbilicus and liver, and kept there till they die, are said to cure the jaundice ; for they contract, it seems, a yellow colour.

There are two small stones in the head of the tench, that have an absorbent, detergent, and diuretic quality. Whatever may be the uses of its slime to the inhabitants of the water, its flesh is certainly a wholesome and delicious food to those of the earth.

The tench has a small head and nose in proportion to the size of the body ; which is broad, thick, and short : the colour of the body is dusky ; the dorsal and ventral fins are of the same colour ; the head, sides, and belly, are of a greenish cast, beautifully mixed with gold, which is in its greatest splendour when the fish

is in the highest season. The tail is blackish, somewhat square, and consists of nineteen rays; the eyes are small, seated on the sides of the head, and the iris is red. The tench delights in still waters, and is seldom found in rivers. Their time of spawning is the latter end of June, or the beginning of July; and they are in season from the beginning of September to the end of May.

THE GUDGEON.

THIS fish is generally found in gentle streams, and is about five or six inches long; with a round body, small scales, a brown or olive coloured back, and a whitish belly; the iris is tinged with red; the gill-covers with green and silver; and at each corner of the mouth is a single barb. The tail is forked; and both that and the dorsal fin is spotted with black. They bite eagerly to a proverb—hence the poet's observation—

What gudgeons are we men!
Every woman's easy prey.

The gudgeon grows to a much larger size in some rivers than in others. We have heard of one taken in that near Uxbridge, which weighed a pound. The flesh is in high esteem, and reckoned little inferior to that of the smelt.

THE BREAM.

THIS is a broad flattish fish, with a small squarish head, and a sharp nose. It is extremely deep and thin in proportion to its length:

length: the top of the head is broad and flat; and the back, which rises like that of a hog, is of a dusky blue colour: the belly and sides are white: the scales are large; the mouth, in proportion to the size of the fish, is very small, and without teeth: the iris of the eye is of a silver colour, and the pupil is small. This fish is an inhabitant of lakes, or the deep parts of still rivers. It is extremely insipid, and consequently very little esteemed.

THE R O A C H.

THE body of the roach is pretty deep, but thin. The back, which is pretty sharply ridged, is of a dusky colour, and sometimes blueish: the belly is pale: the iris of the eyes, the fins and tail, are red. The tail is also forked. It is of a gold colour about the gills, and the mouth is round and destitute of teeth; it being a leather-mouthed fish. It breeds both in ponds and rivers, but those bred in the latter are the best, though the others are the longest. This fish and the dace are coarse and insipid meat.

THE DACE, OR DARE.

THE dace haunts the same places as the roach, and is a great breeder. It is a very lively fish, and in summer delights in frolicking near the surface of the water. The back is varied with dusky and blue; the sides and belly are silvery, and the tail is much forked. It resembles a chub, though it is smaller and somewhat whiter. The iris of the eye is yellow. The flesh of the dace is sweet, soft, and of

of good nourishment, but is in no great esteem. They spawn in February and March, and are fit to eat in April and May; but their highest season is from September to the latter end of February. They delight in gravelly and sandy bottoms, and the deepest part of the river under the shade of trees, or dock leaves.

THE CHUB.

THIS is a very coarse fish, and full of bones; it has a large blackish head, and its body is longer than that of the carp. The back is of a dark green, and the belly and sides of a silver colour. The temples are yellowish, and the scales, like those of the carp, are large and angular. The iris of the eye is of gold and silver colours. The tail is forked, and the fins are of a blackish blue; though sometimes they are tinctured with red. The belly is broadish, and the lateral lines run parallel to the bottom of the belly. The chub is a very timid fish, sinking to the bottom on the least alarm. It does not grow to a very large size; though they have been known to weigh upwards of five pounds.

THE BLEAK.

THE bleak seldom exceeds six inches in length: the body is broadish, and not unlike that of a sprat; the head small; the scales are thin, and of a silver colour, and come off easily. The back is of a blueish or greenish brown, and the eyes are large, marked on the lower side with a blood-coloured spot. The skull

skull is transparent, and the flesh is sweet, delicate, and nourishing. Artificial pearls are made with the scales of the bleak. They are beat into a fine powder, then diluted with water, and introduced into a thin glass bubble, which is afterwards filled with wax. This art was invented by the French, and one artist in Paris has been known to use thirty hampers full of fish in his manufacture in one year. At certain seasons of the year, these fish seem to be affected with the vertigo: they are seen tumbling about near the surface of the water, and are then called mad bleaks by the Thames fishermen.

The bleak spawns in March, and recovers its strength in three weeks. The flesh is sweet, nourishing, and pleasant; but little sought after on account of the diminutive size of the fish.

THE WHITE BAIT.

VARIOUS are the conjectures about this species; the general opinion however is, that they are the fry of some fish. Some attribute it to the bleak, others to the shad, the sprat, and the smelt. It bears a greater similarity to the bleak than to any other, but it is impossible for us to class it with any degree of certainty. In the months of July and August, innumerable multitudes of these fish are taken in the Thames, near Blackwall and Greenwich. They are esteemed very delicious when fried with flower, and the taverns contiguous to those places are much resorted to, when the white bait are in season, by the lower order of epicures.

cures. The head, back, and sides of this fish are silvery; and the back tinged with green. Its usual length is about two inches. It is remarkable, that these fish expire the very instant they are taken out of the water. A wager was laid in the summer of 1775, that a person could not show a live white bait above London bridge. The experiment was tried, a well-boat was procured, and some hundreds of these little fish poured into it the instant they were taken out of the Thames; the utmost expedition was then used to get to the west side of London bridge; after which the fish were immediately inspected, and not one of them remained alive.

THE MINNOW.

THE minnow is much smaller than the gudgeon, has a roundish body, and seldom exceeds three inches in length. Its body is smooth, and the scales are so small as to be hardly visible. The back is flat, and of a deep olive colour: the belly and sides are mottled with scarlet in some, in others white, and in others with a shining blue. The tail is forked, and marked near the base with a dusky spot. These beautiful fish appear in shoals in many of our small gravelly streams.

THE GOLD FISH.

THE gold fish was first introduced into this country about the year 1691, but were not generally known till 1728, when many of them were brought to England. In China gold fish are

are kept for amusement by every person of fashion, either in porcelain or glais vessels, or in the small basons that decorate the courts of the Chinese houses. The form of the gold fish resembles that of the carp: they have been seen in England of the length of eight inches, and Du Halde informs us, they grow to the size of our largest herring in their native country. In the colours of this fish, there is infinite variety: some are marked with a fine blue, a brown, and a bright silver; but the general predominant colour is gold of a most amazing splendour. This species is particularly distinguished by the anal fins, which are placed opposite each other like the ventral fins; and not behind each other like those of other fish.

OF THE DIVISION OF SHELL-FISH.

THESE are usually divided, by naturalists, into crustaceous and testaceous animals. Crustaceous fish, such as the crab and the lobster, are furnished with a shell that is not of a stony hardness, but is in some measure capable of yielding. Testaceous fishes, like the oyster or cockle, are furnished with a shell of a stony hardness; which is brittle, and incapable of yielding. The lobster, the crab, and the tortoise, are of the crustaceous kinds: the numerous tribe of oysters, muscles, cockles, and sea-snails, which offer infinite variety, are of the testaceous kinds.

THE LOBSTER.

THE lobster and the crab, however different in figure, are nearly the same in manners and

conformation. Though without any warmth in their bodies, or even without red blood circulating through their veins, they are animals wonderfully voracious: they seize upon every thing that has life, and whatever they attack is sure to perish, though never so well defended. These voracious animals even devour each other; and they may, in some measure, be said to eat themselves; as they annually change their shell and stomach, and their old stomach is usually the first repast for the new one.

The form of the lobster is so very extraordinary, that the head may be almost mistaken for the tail; but it may be soon discovered that the animal moves with its claws foremost; and that the part which plays within itself by joints, like a coat of armour, is the tail. The two great claws, which are the lobster's instruments of provision and defence, open like a pair of nippers, and have very great power; they are usually notched like a saw, which enables it to take the firmer hold. Besides these instruments, the animal has eight legs, four on each side; which, with the assistance of the tail, give the animal its progressive and sideling motion. The head, which is very small, is between the two claws, and is furnished with eyes, which appear like two black horny specks on each side. The mouth, like that of insects, opens the long way of the body; and is furnished with two teeth for the comminution of its food: between the two teeth there is a fleshy substance in the shape of a tongue. It has also three teeth in the stomach; one on each

each side, and the other below. It has two long feelers or horns, that issue on each side of the head. The tail is the grand instrument of motion ; and with this it can raise itself in the water. Under this the spawn is lodged in great abundance; every pea adhering to the next by a very fine filament, which is almost imperceptible. They continue in this situation till they become furnished with limbs and motion, and then drop off into the water.

After leaving the parent, the young lobsters immediately seek for refuge in the smallest clefts of rocks, or other crevices at the bottom of the sea, where the opening is but small, and such opening can be easily defended. There they grow larger in a very short time, from the mere accidental nourishment which the water washes to their retreats. In a few weeks they acquire an hard, firm shell, which furnishes them with offensive and defensive armour.

The body of the lobster continues to increase, while the shell continues of the same size ; the animal thus becomes too large for its habitation, and is imprisoned within the crust that nature has gathered round it ; and is therefore under the necessity of getting free. As the young of this kind grow faster, they change their shell oftener than the old ; the latter remaining in the same shell for two or three years together. In general, however, they change their shell once a year ; but for some days before it undergoes this change, it ceases to be so voracious as formerly, and lies torpid and motionless, as if in anxious expectation of the approaching alteration.

teration. Just before casting its shell, it throws itself upon its back, and the whole body is in violent motion, and at length the shell is seen beginning to divide at its junctures. It also appears turned inside out, and its stomach comes away with its shell. In a short time, however, this wonderful creature finds itself at liberty, but in so weak and enfeebled a state, that it continues motionless for several hours. After this extraordinary change, it has the softness and timidity of a worm; every animal of the deep being then a powerful enemy, which they can neither escape nor oppose: but this state of defenceless imbecility is of short duration, for in less than two days the skin of its body is almost as hard as before; its appetite also increases; and, however extraordinary it may appear, its first repast is upon its own stomach, and afterwards it devours its former shell. In about forty-eight hours the new shell is perfectly formed, and becomes as hard as that with which it has parted.

Thus newly equipped, the creature ventures more boldly among the animals at bottom, and, in its combats, frequently suffers some mutilation. A joint or a claw is sometimes lost in these encounters, which nature quickly repairs; a new claw speedily springs out, which, at first, is small and tender, but in the space of three weeks becomes *almost* as large as the old one which is lost; but it never arrives to the full size: we often see the claws of lobsters of unequal magnitude, which is thus accounted for.

There

There are many variations of this extraordinary animal: it is found above three feet in length, and if we admit the shrimp and the prawn in the class, it is sometimes seen not above an inch: these all live in the water, and cannot long endure its absence: the shell, when taken out of the water, is black, but becomes red by boiling.

The river CRAW-FISH differs little from the lobster, but it will live only in the fresh water, and the other only in the sea.

THE CRAB.

THE crab resembles the lobster in its habits and conformation, but differs materially in shape: it is found equally in fresh and salt water, as well upon land as in the ocean: the tail is not so apparent as in the former, being that broad flap that appears to cover a part of the belly, and, when lifted, discovers the spawn situated there in great abundance: like the lobster, it has two claws; and, like the lobster, it has eight legs, four on each side: like the lobster, it is also a bold voracious animal, and indeed it resembles that creature in every thing but the amazing bulk of its body, compared to the size of its head, and the length of its intestines, which have many convolutions.

There are different species of this animal, as the VIOLET and WHITE CRAB of the CARIBEE ISLANDS; the SOLDIER-CRAB; the SEA-CRAB; the SQUARE-CRAB; the SOUTH AMERICAN CRAB; the INDIAN LAND-CRAB, &c. but they have all one property, which is very

wonderful. When their nippers are laid hold of, they can easily part with them to make their escape; besides, if one of them should happen to be wounded, the animal immediately parts with it, and by that means gets rid of the wound and the limb together, well knowing that Nature will soon furnish it with another.

THE TORTOISE.

TORTOISES are usually divided into those that live upon land, and those that subsist in the water; and use has made a distinction even in the name, the one being called tortoises, the other turtles. Seba has proved, however, that all tortoises are amphibious; that the land tortoise will live in the water, and that the sea turtle can be fed upon land. The land tortoise is generally found from one foot to five feet long, from the end of the snout to the end of the tail, and from five to eighteen inches across the back. It has a small head, somewhat resembling that of a serpent; an eye without the upper-lid, the under eye-lid serving to cover and keep that organ in safety. It has a long scaly tail like that of the lizard. It can put out or conceal its head at pleasure, under the great pent-house of its shell, where it can remain secure from all attacks.

Though peaceable in itself, the tortoise is admirably formed for war, and seems almost endued with immortality. Nothing can kill it; the depriving it of part of its body is but a slight injury; it will live though deprived of the brain; it will live though deprived of the

head. Redi informs us, that he made a large opening in the head of a land tortoise, drew out all the brain, and washed the cavity so as not to leave the smallest part remaining, and then, leaving the hole open, set the animal at liberty. Notwithstanding this, the tortoise marched away without seeming to have received the smallest injury, and lived without a brain for six months. The Italian philosopher carried his experiment still farther, for he cut off the head, and the animal lived twenty-three days after its separation from the body.

Tortoises are also remarkable for their longevity; they are commonly known to live upwards of eighty years: there was one kept in the garden belonging to Lambeth-palace, that was remembered above 120.

This animal retires to some cavern to sleep for the winter; and at that time, when its food is no longer in plenty, it happily becomes insensible to the want; it is sometimes buried two or three feet in the ground, having first providently furnished its hole with moss, grafts, and other substances, as well to keep the retreat warm as to serve for food, in case it should prematurely wake from its state of stupefaction. From this dormant state the tortoise is awakened by the genial return of spring.

These animals are frequently taken into gardens, as they are thought to destroy insects and snails in great abundance. The strength of the tortoise is very great; children have been seen to get upon the back of it, and it has not appeared to be over-loaded, but moved off

off with its burthen to where it expected to be fed, but would carry them no farther.

In their external form, all tortoises nearly resemble each other, their outward covering being composed of two great shells; one of which is laid upon the other, and they touch only at the edges; but upon a closer inspection we shall find, that the upper shell is composed of no less than thirteen pieces, which are laid flat upon the ribs, like the tiles of an house; by which the shell is kept arched and supported. Indeed, to an inattentive observer, the shells, both above and below, seem to make each but one piece; but they are bound together at the edges by very strong and hard ligaments.

THE SEA TORTOISE, OR TURTLE.

TURTLES are usually distinguished by sailors into four kinds; the trunk turtle, the logger-head, the hawksbill, and the green turtle.

The green turtle, however, is the most celebrated, and the most valuable of all the animals of the tortoise kind; the delicacy of its flesh, and its nutritive qualities, together with the property of being easily digested, are now well known among us. Dampier appears to be the first who informed us of the distinctions among these animals; and that, while the rest might be valuable for other purposes, the green turtle alone was chiefly prized for the delicacy of its flesh. The green turtle is, indeed, become a branch of commerce, and ships are provided with conveniences for supplying them with water and provision, to bring them over in health

health from Jamaica and other West India islands: this cannot, however, be always effected, for tho' they scarcely require any provision upon the voyage, yet the working of the ship occasions them to be beat against the sides of the boat which contains them, by which they become very lean and battered; so that, in order to eat this animal in the highest perfection, instead of bringing the turtle to the epicure, the epicure ought to be transported to the turtle.

The colour of the shell of this animal is rather greener than that of others of this kind; whence it has the name of the green turtle: those which are 200lb. weight are the most common size, though they are sometimes found to exceed 500lb. During the season, the citizens of London are remarkable for regaling themselves upon turtle, and great numbers of these animals are dressed at the different taverns in the city. The late Mr. Alderman Bates, who kept the Queen's Arms Tavern in St. Paul's Church Yard, to mark the extremes as to size, exhibited at one time three turtles, two of which together did not weigh three ounces, and the other exceeded 900lb. weight. The ancients, however, speak of much larger turtles: *Ælian* assures us, that the houses in the island of Taprobane are usually covered with a single shell; and *Diodorus Siculus* tells us, that a people neighbouring on Ethiopia, called the turtle-eaters, coasted along the shore in boats made of the upper shell of this animal.

The turtle seldom comes from the sea but to deposit

deposit its eggs, and sometimes to sport in fresh water: in about twenty-five days after laying, the eggs are hatched by the heat of the sun; and the young turtles, about the size of quails, are seen bursting from the sand, as if earth-born, and running directly to the sea, with instinct only for their guide; but it sometimes happens, that the surges of the sea beat them back upon the shore, and they become a prey to the innumerable quantities of birds which, at that time, haunt the coasts.

OF SEA SNAILS.

THOUGH the land and sea snails resemble each other in several particulars, many of the latter are totally destitute of horns, and none of them have more than two; indeed, if the horns of snails are furnished with eyes, and if, as some imagine, the length of the horn, like the tube of a telescope, assist vision, these animals, which reside in the gloomy bottom of the deep, can have no great occasion for them.

On viewing the shells of sea snails, we are convinced, that the animal which produces them is larger than those of the same denomination upon land. The sea appears to have the property of enlarging the magnitude of all its inhabitants. There is also a difference in the position of the mouth of the garden and sea snail; in the former the mouth is placed cross-wise, as in quadrupeds, furnished with jaw-bones, lips and teeth: in most of the sea-snails the mouth is placed longitudinally in the head; and, in some, obliquely, or on one side.

Others,

Others, of the trocus kind, are without a mouth, but are furnished with a trunk, which is very long in some kinds, and shorter in others: those which are provided with this trunk, are, among snails, what the tiger, the eagle, or the shark, are among beasts, birds, or fishes: the whole race of shelled animals avoid their approach, and their strongest built habitations yield to the superior force of these invaders: though their own shells are thick and clumsy, yet their motion at the bottom is swifter than that of most other shell-fish, and they seize their prey with greater facility; they boldly venture to attack even the largest shells, and with their piercing trunk bore it through in a very short time, and destroy its inhabitant.

But, of all sea snails, that which is most frequently seen swimming on the surface is the *NAUTILUS*, of which there are several species, tho' they may be all divided into two; the one inhabits a small white shell as thin as paper, which it is often seen to quit and resume again; the other has a thicker shell, of the colour of mother-of-pearl, and but seldom quits it: this shell, externally, resembles that of a large snail, but it is generally six or eight inches across; within it is divided into forty partitions, that communicate with each other by doors, if we may so call them: but the peculiarity for which the nautilus has been the most distinguished, is its spreading the thin oar, and catching the flying gale, to use the poet's description of it. These animals, especially those of the light kind, are chiefly found in the Me-
diter-

diterranea; in a calm sea, they are observed floating on the surface, some spreading their little sail, some rowing with their feet, as if they were engaged in business of the utmost consequence, and others floating upon their mouths, like a ship with the keel upwards.

The nautilus has eight feet, which issue near the mouth, and may as properly be called barbs; these are connected to each other by a skin, resembling that between the toes of the duck, but thinner and more transparent; six of these feet are shorter than the rest, and are held up as sails to catch the wind in sailing; the two others, which are longer, are kept in the water, serving, like paddles, to steer their course by. When the weather is calm, it is seen expanding only a part of its sail, and rowing with the rest.

Sea snails, of every species, appear to be a much more active animated tribe, than from their figure we should be induced to imagine. Though they seem, to an inattentive spectator, as mere inert masses of soft flesh, rather *loaded* than *covered* with a shell; when more closely examined, they are found to be furnished with the organs of life and sensation in tolerable perfection; and are possessed of appetites more poignant than those of animals that seem more perfect in their formation.

OF FISHES OF THE OYSTER KIND.

THE OYSTER differs very little from the MUSCLE, except in the thickness of its shell, and its greater imbecility. It is formed with organs

organs of life and respiration ; with intestines which are very voluminous, and with a liver, lungs, and heart. Like the muscle it is self-impregnated, and the shell which the animal soon acquires, serves it for its future habitation. Like the muscle, it opens its shell to receive the influx of water, and like that animal is strongly attached to its shell both above and below.

In many particulars, however, the oyster differs from the muscle. The shells are not equal like those of the muscle, the one being cupped, and the other flat : it always rests upon the cupped shell, for it would lose all its water if it lay upon the flat side. The shells of the oyster are also thicker than those of the muscle : they are, indeed so strongly lined and defended, that no animal will attempt to pierce them.

The muscle is capable of erecting itself on an edge, and going forward with a slow laborious motion ; but the oyster is utterly unable to change its situation. It is wholly passive, and endeavours by all its powers to remain fixed to one spot at the bottom. Rocks, stones, seaweeds, &c. secure it against the agitation of the waves. In the rivers of the tropical climates, oysters are frequently seen growing even amidst the branches of the forest. Trees on the banks of the stream often bend their branches into the water, and particularly the mangrove, which delights in a moist situation : on these the oysters hang in clusters ; and in proportion as their weight sinks the plant into

the water (where it still continues growing) the oysters increase in number, and hang upon the branches. These animals will adhere to any thing, and are often found sticking to each other. This is effected by means of a kind of glue, which, when it cements, the joining is as hard as the shell, and is as difficult to be broken. Sometimes, indeed, the oyster grows to the rocks, somewhat like the muscle, by threads; but these only take root in the shell, and do not spring from the body of the fish itself, as in the muscle.

Oysters usually cast their spawn in May; in the space of two or three days the young are covered with a shell, and in three years the fish is large enough to be brought to market. As they continue in the places where they are deposited, and as they seem to have no other food than the afflux of sea water, it is the custom at Colchester, and other places where the tide settles in marshes on land, to pick up large quantities of young oysters along the shore, which hardly exceed the size of a sixpence. These are placed in beds where the tide comes in, where they remain for the space of two or three years, and are then of a proper size to be taken for sale. Oysters are said to be better tasted for being thus sheltered from the agitations of the deep; and the fresh water which mixes with the salt in these repositories, is said to increase their growth and fatness, and to improve their flavour.

But these oysters are much smaller than those which are found sticking to rocks at the bottom of

of the sea, usually called rock-oysters: these are sometimes found five or six inches in diameter, and are esteemed excellent food; but even these are very diminutive, compared to the oysters of the East Indies, some of which are upwards of two feet over: those found along the coast of Coromandel are capable of furnishing a plentiful meal to eight or ten people, but they are much inferior to ours, both in delicacy and flavour.

Other bivalved shell-fish, such as the COCKLE, the SCALLOP, and the RAZOR-SHELL, have very minute distinctions. The scallop is principally remarkable for its method of moving forward upon land, or swimming upon the surface of the water. When it is deserted by the tide, it makes very extraordinary efforts to regain the water, moving towards the sea in a most singular manner. When in the water, it is capable of raising itself to the surface, supporting itself there, and even of making its way with some degree of celerity.

The pivot, or razor-shell, which has the latter name from its resembling the haft of a razor, has all its motions confined to sinking or raising a foot downwards or upwards in the sand, for it never quits the spot where it was first planted. It is frequently seen to rise about half way out of its hole, but as soon as it is disturbed, it sinks perpendicularly down again.

It is in this class of shell-fish that pearls are found in greatest abundance; and it is in the internal parts of these shells which are of a

shining silvery colour, that these gems are usually generated; but the pearl is also found in the muscle or scallop, as well as in the oyster: but that which particularly obtains the name of the pearl oyster, has a large strong whitish shell, wrinkled and rough without, and within smooth, and of a silver colour. From these the mother-of-pearl is taken, which is nothing more than the internal coats of the shell, resembling the pearl in colour and consistence.

The roundest pearls, and those of the best colour, are brought from the east: they are whiter and more regular than the American pearls; but they all become yellow in time. When kept in damp places they decay, and moulder into a substance not much harder than chalk. The greatest pearl fisheries are in America and Asia; but as pearls are less valuable than they formerly were, those of America are in a great measure discontinued.

THE SEA URCHIN.

AT the first view, the sea urchin may be compared to the husk of a chesnut, being like it in shape, and having a number of bony prickles standing out on every side. The mouth is placed downwards; the vent is above; the shell is a hollow base, resembling a scooped apple, and is filled with a soft muscular substance, through which the intestines wind from the top to the bottom. The mouth, which is large and red, is furnished with five sharp teeth, which are easily discerned. It is principally remarkable on account of its horns and spines,

spines, which point from every part of the body, like the horns of a snail, and serve at once as legs to move upon, as arms to feel with, and as instruments of capture and defence.

It is in general observed of insects, that those which have the greatest number of legs, always move the slowest; this animal, however, is an exception to the general rule, for though it is furnished with two thousand spines, and twelve hundred horns, all serving for legs, and from their number seeming to impede each other's motion, yet it moves at the bottom with some degree of swiftness. Some kinds of this animal are as good eating as the lobster, and its eggs, which are red, are esteemed a great delicacy.

The acorn shell-fish, the thumb-footed shell-fish, and the imaginary barnacle, resemble the sea urchin in shape, but are very different in motion. They are fixed to one spot, and appear to vegetate from a stalk. To an inattentive spectator, each appears to be a kind of fungus that grows in the deep, destitute of animal life as well as motion; but it has a cover, by which it opens and shuts its shell at pleasure. It has twelve long crooked arms, furnished with hair, which it thrusts forth for its prey; and eight smaller, which are generally kept in the shell.

But of all animals of the shelly tribe, the PHOLAS is the most wonderful. The pholas assumes different figures, but in general it somewhat resembles a muscle, except that the shell is composed of five or more pieces; the

smaller valves serving to close up the openings, left by the irregular meeting of the two principal shells. But the most wonderful part of their history is that of their penetrating into rocks, and taking up their residence there. When divested of its shell, this animal resembles a roundish soft pudding: it is, indeed, furnished with two teeth, but they are so situated as to be incapable of touching the hollow surface of its stony dwelling. The instrument with which it performs all its operations, and buries itself in the hardest rocks, is only a broad fleshy substance, resembling a tongue, which is seen issuing from the bottom of the shell. Thus, furnished with the bluntest and softest augre, it effects, by patience and successive applications, what other animals are incapable of performing by force, penetrating the hardest bodies only with its tongue. It begins to make its way into the stone while young and little by a very narrow entrance; and as it grows bigger it enlarges its apartments. Here it continues at ease for its life, and the sea water, which enters at the little aperture, supplies it with luxurious plenty.

THE
NATURAL HISTORY
OF
REPTILES AND INSECTS.

THE FROG.

THE frog is an animal too well known to require much description; but some of its properties are too singular to be passed by unnoticed. Compared to the bulk of its body, its leap or spring is remarkably great; and it is the best swimmer of all four-footed animals. Though it may appear superfluous to describe the form of animals so well known as the frog and toad, it may be necessary to mark those differences which distinguish them from each other. The frog moves by leaping; the toad crawls along the ground: the frog is, in general, smaller than the toad; it has a brighter colour, and a more polished surface: the toad is brown, rough, and dusky. The frog is light and nimble, and its belly is small in proportion to the size of the animal; the toad is slow, corpulent, and heavy: their internal parts are nearly

nearly the same. The frog has a very little brain for its size; it has a very wide swallow; the stomach is apparently small, but capable of great distention.

The egg which produces a tadpole, or young frog, is small, black, and globular, and as soon as the animal gets free, it sinks to the bottom of the water, whence it never rises while it continues in its tadpole state.

The frog is longer out of the water than in it; but when the cold nights begin to set in, it returns to its native element, always chusing stagnant waters, where it can lie concealed at the bottom. Frogs, as well as all other reptiles, feed but a small space of the year. During winter, frogs and toads remain in a torpid state; the latter of which will dig into the earth, and cover themselves with almost as much agility as the mole. - Frogs live upon insects of all kinds; they continue motionless till their prey appears, and when it comes sufficiently near, they jump forward with great agility, dart out their tongues and seize it. In this animal, as well as in the toad, lizard, and serpent kinds, the tongue is extremely long, and formed in such a manner that it swallows the point down its throat; it therefore draws out a length of tongue, like a sword from its scabbard, to assail its prey; and whatever insect touches its tongue infallibly adheres to it, Nature having furnished it with a glutinous substance for that purpose.

The croaking of frogs is well known, and from thence they are distinguished by the ludicrous title of Dutch nightingales and Boston waiters

waits in the fenny countries. Of all frogs, however, the male only croaks; before wet weather their voices are in full exertion; they are then heard, with unceasing assiduity, sending forth their call, and welcoming the approaches of their favourite moisture.

The male frog is usually of a greyish brown colour; the female is more inclining to yellow, speckled with brown.

THE TOAD.

THE toad, in some degree, resembles the frog, but its belly is more inflated, and skin more full of tubercles: it is of an ash colour, with brown, blackish, and yellow spots. It does not croak like the frog, but makes an obscure, indistinct noise, like the word *geu*, or rather *bu*. It is the most deformed and hideous of all animals; the body broad, the back flat, and covered with a pimply dusky hide; the belly large, swagging, and swelling out; the legs short, and its pace laboured and crawling; its retreat gloomy and filthy: in short, its general appearance is such as to strike one with disgust and horror; yet we have been told by those who have resolution to view it with attention, that its eyes are fine. The hideous appearance, however, of the toad is such, as to make this one advantageous feature overlooked, and to have rendered it, in all ages, an object of horror.

As to the notion of its being a poisonous animal, our opinion is, that its excessive deformity, joined to the faculty it has of emitting

a juice

a juice from its pimples, and a dusky liquid from its hind parts, is the foundation of the report. That it has any noxious qualities, we have been unable to bring proofs in the smallest degree satisfactory, though we have heard many strange relations on that point. On the contrary, we know several persons who have taken them in their naked hands, and held them long without receiving the least injury: it is also well known that quacks have eaten them, and have, besides, squeezed their juices into a glass, and drank them with impunity. It may also be observed, that these reptiles are a common food to many animals; to buzzards, owls, Norfolk plovers, ducks, and snakes, who would not touch them were they in any degree noxious. So far from having venomous qualities, they have of late been considered as if they had beneficent ones. The common toad was first introduced into medicine upon a cure being performed on a person who had the dropsy, to whom powdered toads were maliciously given in order to dispatch him; but he voided a large quantity of urine after taking it, and soon recovered of his disorder. Since this, toads, gently dried and powdered, have been used as a diuretic. It is said, that cancerous complaints may be cured by a toad; it is, however, certain, that great relief has been obtained by that animal's sucking a cancerous breast. The whole of the animal, except its head, is put into a linen bag, and the head is held to the part. It generally seizes the foulest part of the sore in an instant, and sucks with greediness

Bull Frog



Pipal





greediness till it drops off dead. It frequently happens, that the creature swells immensely. Some have lived about a quarter of an hour after sucking, others much longer. Some have been known to suck upwards of four hours, and then dropped dead from the wound, swelled exceedingly, and turned of a pale colour. During the time of their sucking, they are heard to smack their lips like a young child.

THE PIPAL, OR SURINAM TOAD.

THE form of this animal is even more hideous than that of the common toad: the body is flat and broad; the head small, the skin of the neck forms a kind of wrinkled collar; the colour of the head is of a dark chesnut, and the eyes are small; the back is of a lightish grey, and seems covered with a number of small round eyes, placed at nearly equal distances. These eyes are very different from what they seem; for they are the animal's eggs, covered with their shells, and placed there for hatching. These eggs are buried deep in the skin, and hardly appear in the beginning of incubation; but they are very visible when the young animal is about to burst from its confinement. Their colour is a yellowish red, and the spaces between them are full of small warts, resembling pearls. In all nature, there is not perhaps a more extraordinary phenomenon, than that of an animal breeding and hatching its young in its back: from whence, when arrived at maturit they crawl out one
after

after the other. This animal, like the rest of the frog kind, is most probably harmless; though we are told of terrible effects resulting from its powder when calcined.

OF LIZARDS IN GENERAL.

IT is difficult to say to what class in nature lizards are chiefly allied. They cannot properly be raised to the rank of beasts, as they bring forth eggs, dispense with breathing, and are not cloathed with hair. They cannot be ranked with fishes, as the majority of them live upon land: their feet, upon which they run with great celerity, exclude them from the serpent tribe; and they cannot be placed among insects, on account of their size. But, though the lizard is in some measure excluded from every rank, it exhibits somewhat of the properties of all: it has the legs and celerity of the quadruped; the facility of creeping through narrow and intricate ways, like the serpent; and the power of living in the water like the fish.

THE CROCODILE.

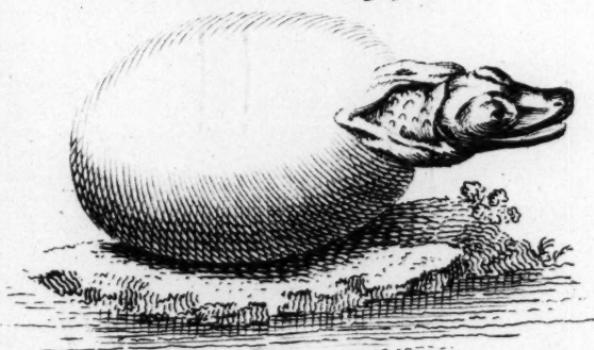
THIS animal is placed at a happy distance from the inhabitants of Europe. To look for the crocodile in all its natural terrors, grown to an enormous size, and committing unceasing devastations, we must go to the uninhabited regions of Africa and America. In the river Amazons, or the river Niger, they are found from eighteen to twenty-seven feet in length; and



Crocodile



Crocodiles Egg



and sometimes lying as close to each other as a raft of timber in the Thames.

Of this animal there are two kinds; the Crocodile properly so called, and the Cayman or Alligator. The usual distinctions between the crocodile and alligator are these: the body of the crocodile is more slender than that of the alligator; its snout runs off tapering from the forehead like that of a greyhound, while that of the other is indented like the nose of a lap-dog. The crocodile has a much wider swallow, and is of an ash colour; the alligator is black, varied with white, and is said to be less mischievous. The crocodile grows to a great length, sometimes exceeding thirty feet long, from the tip of the snout to the end of the tail; its most usual length, however, is eighteen. The fore legs have the same parts and conformation as the arms of a man, both within and without. The hands, if they are entitled to that appellation, have five fingers: the hinder legs, including the thigh and paw, are about two feet long; the paws are divided into four toes, of which three are armed with large claws; these toes are united by a membrane, resembling those of a duck, but thicker; the head is long, with a little rising at the top; but the rest is flat, and especially towards the extremity of the jaws. The skull is rough, and unequal in several places; and about the middle of the forehead are two bony crests, about two inches high: the skull between these two crests is proof against a musquet-ball. The eye, in proportion to the rest of the body,

is very small. Above the eye the ear is placed, which opens from above downwards, as if it were by a kind of spring; the nose is in the middle of the upper jaw, near an inch from its extremity, and perfectly round and flat, of a black, soft, spongy substance, not unlike the nose of a dog. The jaws shut one within another, and inclose about thirty teeth, with several void spaces between them: the mouth is fifteen inches in length, and eight and an half in breadth, where broadest. The distance of the two jaws, opened as wide as they may be, is fifteen or sixteen inches. The colour of the body is a dark brown on the upper part, and a whitish citron below, with large spots of both colours on the sides. From the shoulders to the extremity of the tail, it is covered with large scales of a square form, disposed like parallel girdles, and fifty-two in number, but those near the tail are thinner than the rest. The gullet is large in proportion to the mouth, and a ball of wood, as large as a man's head, has been readily run down, and been drawn up again. The tongue, which some have erroneously asserted this animal was without, consists of a thick, spongy, soft flesh, and is strongly connected to the lower jaw. Such is the figure and size of one of these formidable animals when fully grown. They are seen in some places lying near a river for whole hours, and even days, stretched in the sun, and motionless; so that a person unacquainted with the sight, might mistake them for trunks of trees, covered with a rough and dry

dry bark ; but the mistake would soon be fatal, if not prevented ; for the torpid animal, at the near approach of any living thing, darts upon it with instant swiftness, and at once drags it down to the bottom. In the times of an inundation, they sometimes enter the cottages of the natives, where the dreadful visitant seizes the first animal it meets with. There have been several examples of their taking a man out of a canoe in the sight of his companions, without their being able to afford him the least assistance.

Though less powerful upon land than in the water, the crocodile is terrible even there. It seldom leaves the water, except pressed by hunger, or with a view of depositing its eggs. It usually floats along upon the surface, and seizes whatever animals come within its reach ; but when this method fails, it then goes nearer to the bank. Disappointed of its fishy prey, it there waits covered up among the sedges, in patient expectation of some land animal that comes to drink ; the dog, the bull, the tiger, or man himself. Nothing is to be seen of the insidious destroyer as the animal approaches, nor is its retreat discovered till it be too late to escape its fury. It seizes the victim with a spring, and goes at a bound much faster than so unwieldy an animal could be thought capable of exerting ; then having secured the creature with both teeth and claws, it drags it into the water, sinks with it to the bottom, and drowns it in an instant. In its depredations along the bank, the crocodile sometimes seizes on a crea-

ture as formidable as itself, and meets with a most desperate resistance. Frequent combats happen between the crocodile and the tiger. Creatures of the tiger kind are continually oppressed by a parching thirst, which keeps them always in the vicinity of great rivers, whither they descend to drink very frequently. Upon these occasions they are seized by the crocodile, and they die not unrevenged. The instant they are seized upon, they turn with the greatest agility, and force their claws into the crocodile's eyes, while he plunges with his fierce antagonist into the river; there they continue to struggle for some time, till at last the tiger is drowned.

The crocodile thus seizes and destroys every animal, and is equally dreaded by all: man alone can combat it with success. Labat assures us, that a negro, with no other weapons than a knife in his right hand, and his left arm wrapped round with a cow's hide, ventures boldly to attack this animal in its own element. As soon as he approaches the crocodile, he presents his left arm, which the animal most greedily swallows; but sticking in its gullet, the negro has time to give it several stabs under the throat, and the water also getting in it at the mouth, which is held involuntarily open, the creature soon becomes swelled as large as a tun, and expires.

Hitherto we have described the crocodile as it is found in unpeopled countries, and undisturbed by frequent encounters with mankind. In this state it is fierce and cruel, attacking every

every object that seems endued with motion ; but in Egypt, and other countries long peopled, where the inhabitants are civilised and the rivers frequented, this animal is solitary and timid. Instead of coming to attack a man, it sinks at his approach with the utmost precipitation ; and, as if sensible of superior power, ever declines the engagement. This may account for the different characters which have been given us of the crocodile and alligator by travellers at different times ; some describing them as harmless and fearful, others ranking them among the destroyers of nature. The truth is, the animal has been justly described by both ; being such as it is found in places, differently peopled or differently civilised. Wherever the crocodile has reigned long unmolested, it is fierce, bold, and dangerous ; wherever it has been harassed by mankind, its retreats invaded, and its numbers destroyed, it is there timorous and inoffensive. Instead of being formidable, this animal, in some places, is not only inoffensive, but is cherished and admired. In the river San Domingo, the crocodiles are the most inoffensive animals in nature ; the children play with them, ride about on their backs, and even beat them sometimes without receiving the smallest injury. The inhabitants, indeed, are very careful of this gentle breed, and consider them as harmless domestics.

Crocodiles always breed near fresh waters, and produce their young by eggs ; for which purpose the female, when she comes to lay, chuses

a place by the side of a river, or some fresh-water lake, to deposit her brood in. She always pitches upon an extensive sandy shore, where, having deposited her whole quantity, about 300, of the size and figure of a tennis ball, and having covered them close up in the sand, they are soon vivified by the heat of the sun; and at the end of thirty days the young ones begin to break open the shell. The female is then instinctively taught that her young ones require relief; she therefore goes upon land to scratch away the sand, and set them at liberty. They soon avail themselves of their liberty; a part run unguided to the water, and another part ascend the back of the female, and are carried thither in greater safety.

So numerous a brood as these animals bring forth would soon over-run the earth, were they not in a great measure destroyed by the ichneumon * and the vulture †.

THE SALAMANDER.

AS the ancients saw the earth, the air, and water inhabited, fancy was set to work to form an inhabitant of fire, and thus to people every part of nature. They have described a lizard that is bred from heat, that lives in the flames, and feeds upon fire as its proper nourishment. It is universally known, however, that there is no such animal existing.

* See The Natural History of Beasts, printed for E. Newbery, p. 125.

† See The Natural History of Birds, published also by E. Newbery, p. 22.

The salamander is an animal of the lizard kind; and if we suppose the tail of a lizard applied to the body of a frog, we shall form a tolerable idea of its figure. The salamander, and many others of the lizard tribe, are said to have venom; but it is certain, that all with which we are acquainted in this country, are perfectly harmless; and it is equally true, that for a long time, till our prejudices were removed, we considered not only the newt, but the snake and the blind-worm, as fraught with the most destructive poison. At present we have got over these prejudices; and it is probable, that if other nations made the same efforts for information, it would be found, that the malignity of most, if not all, of the lizard tribe, existed only in the imagination.

The salamander best known in Europe is from eight to eleven inches long, usually black, spotted with yellow; and when taken in the hand feeling extremely cold. The idle report of its being inconsumable in fire, has caused many of these poor animals to be burnt. When thrown into the fire, the creature is seen to burst with the heat of its situation, and to eject its fluids; but we are gravely told, in the Philosophical Transactions, that this is a method the animal takes to extinguish the flames.

The salamander is a viviparous animal, and produces above fifty at a time, in full perfection, and the young quickly leave the parent to shift for themselves. It seems timid and inoffensive, feeding only on worms and insects. These animals are amphibious, or at least

least are found capable of subsisting in either element, when placed there; if those taken from land are put into water, they continue there in seeming health; and, on the contrary, those taken from the water will live upon land. In water, however, they exhibit a greater variety in their appearance; and what is equally wonderful with the rest of their history, during the whole spring and summer this water lizard changes its skin every fourth or fifth day, and during the winter every fifteen days. This operation they perform by means of the mouth and claws, and it seems a work of no small difficulty and pain. The cast skins are frequently seen floating on the surface of the water: they are sometimes seen also with part of their old skin still sticking to one of their limbs, which they have not been able to get rid of. This also often corrupts, and the leg drops off; but the animal does not seem to feel the want of it, for the loss of a limb to all the lizard kind is but a trifling calamity: they can live several hours even after the loss of their head; and for some time, under dissection, all the parts of this animal seem to retain life; but the tail is the part that longest retains its motion. Salt seems to be much more efficacious in destroying these animals than the knife; for, upon being sprinkled with it, the whole body emits a viscous liquor, and the lizard dies in a few minutes in great agonies.

THE SCALY LIZARD.

THE length of this animal, from the nose to



Brown Lizard.



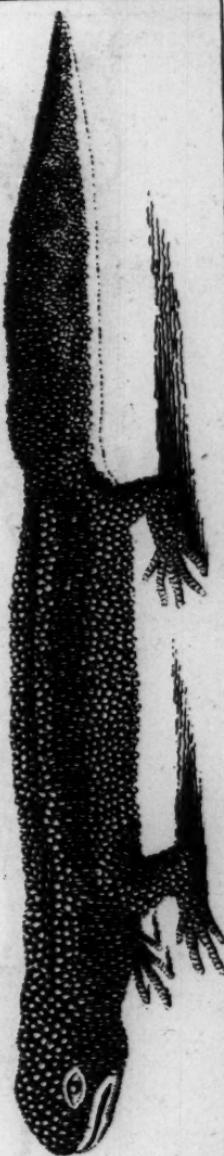
Scaly Lizard



panz.



Warty Lizard





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to the hind legs, is about three inches; and from thence to the end of the tail, three inches and three quarters. It has a black list along the back, and a brown one on each side; beneath that it has a broad black one. The belly is yellow, and the scales large and even: the scales on the back are small, varied with black and brown: the legs and feet are dusky, each foot having five toes furnished with claws. This species is extremely nimble; in hot weather it is frequently seen basking on the sides of dry banks or old trees; but, on being observed, it immediately retreats to its hole. The food of this, and every other species of English lizards, is insects. All the lizards of this country are perfectly harmless; it is their form only that disgusts us, and has occasioned them to be represented in an unfavourable light.

THE WARTY LIZARD.

THIS animal is six inches and a half in length, of which the tail is about three inches and a quarter. The iris of the eye is yellow. The head and part of the back is flat, of a dark dusky colour, and covered with small pimples or warts; the sides are covered with white warts; the belly is of a bright yellow, spotted with black. The fore-feet are divided into four toes, the hind feet have five; they are all dusky, spotted with yellow, and without nails. The pace of this lizard is slow and crawling.

THE GREEN LIZARD.

THE green lizard is so called from its colour,

lour, and it is larger than the common sort. It delights in warm countries, and is very common in Italy. They are found on trees in the summer time, where they make a noise like the croaking of frogs.

THE BROWN LIZARD.

THIS species is about three inches long; the body is slender; the tail long, small, and taper. The upper part of the body is of a pale brown, marked on each side of the back with a narrow black line, extending to the end of the tail. The belly is of a pale yellow, marked with small dusky spots.

THE CAMELEON.

THIS little animal, like the crocodile, proceeds from an egg; and it also nearly resembles that formidable creature in form; but it differs considerably in its size and its appetites: it is not above eleven inches long, and delights to sit upon trees, being afraid of serpents, from which it is unable to escape on the ground. Its natural colour is a blueish grey: but the wonderful part of this animal's history is, when it is removed into the sun. At first it appears to suffer no change of colour, the greyish spots with which its body is covered still continuing the same; but the whole surface soon appears to imbibe the rays of light; and the simple colouring of the body changes into a variety of beautiful hues. Wherever the light comes upon the body it is of a tawny brown; but that part of the skin on which the sun does not shine,

shine, changes into several brighter colours, pale yellow, or vivid crimson, which form spots of half the size of a man's finger; when the sun ceases to shine, the original grey colour returns by degrees, and covers all the body.

When the cameleon changes place, and attempts to descend from an eminence, it moves with the utmost precaution, advancing one leg very deliberately before the other, and securing itself by holding whatever it can grasp by the tail. It seldom opens the mouth, except for fresh air; and when that is supplied, discovers its satisfaction by its motions and the frequent changes of its colour. The tongue is sometimes darted out after its prey, which is flies; and this is as long as the whole body. The cameleon is chiefly found in Smyrna and other parts of the Levant.

THE VIPER.

THIS animal differs from other serpents in moving more slowly, in never bounding or leaping, and in bringing its young to perfection before they are excluded. The females of other serpents lay eggs, which are either hatched by the heat of the sun, or in the place of the retreat. Vipers are found in many parts of this island, particularly in the dry, stony, and chalky countries. Providence is extremely kind in not suffering this species to be prolific, more than ten or eleven eggs being seldom found in one viper: these are about the size of a blackbird's egg, and appear as if they were chained together.

The

The viper seldom exceeds two feet in length, though they are sometimes found very little short of three feet. The ground colour is a dirty yellow; that of the female of a deeper yellow. Its back is marked with a kind of chain of black spots, touching each other at the points. A little below is another row of blackish spots, and on the lower part of the sides there is a line consisting of little white spots, and then another of black, which are larger. The head is inflated, which distinguishes it from the common snake. The tongue is forked; the teeth small; the four canine teeth are placed two on each side of the upper jaw; the instruments of poison are long, crooked, and moveable, and can be raised and depressed at pleasure; they are hollow from near the point to their base, and the action which gives the wound, forces the fatal juice into it, through the tooth.

Vipers generally cast their skins twice a year, and the succeeding ones always appear brighter and more beautiful than those which they have quitted. When the skin is taken off, and the viper cut into several pieces, it will remain alive for several hours, and the head is always ready to bite; nor will the bite be less dangerous than at another time. Vipers do not, like other serpents, make holes in the earth, but usually hide themselves under stones, or the ruins of old houses. In fine weather, however, they are frequently found in tufts of grass and among bushes.

We are assured, from good authority, that the young of the viper, when terrified, will run down the throat of the parent, and seek shelter in its belly, in the same manner as the young of the Opossum * retire into the ventral pouch of the old one. Hence it has been imagined by some, that the viper is so unnatural as to devour its own young.

The physicians in Italy and France very frequently prescribe the broth and jelly of vipers flesh, to invigorate and purify the mass of blood exhausted with diseases, or tainted with some vicious and obstinate ferment. From which it appears, that the main efficacy of the viperine flesh is to quicken the circulation of the blood, promote its due mixture, and by this means cleanse and scour the glands of those stagnating juices, which, turning to acidity, are the origin of many, at least, of those troublesome distempers in the surface of the body, which go under the names of scrophulous and leprous.

The bite of this animal is dreadful, and unless immediate remedy be applied, is certain death. Viper-catchers have a remedy in which they place so great confidence, as to be no more afraid of a bite than of a common puncture, immediately curing themselves by the application of their specific. This, though they keep it as a great secret, has, upon inquiry, been found to be no other than the *axungia viperina* presently rubbed into the

* See the Natural History of Beasts, p. 116.

wound. To prove which, a gentleman enraged a viper to bite a young dog in the nose ; both the teeth were struck deep in ; he howled bitterly, and the part began to swell. The gentleman diligently applied some of the axun-gia, which was provided for the purpose, and the dog was very well the next day. But because some gentlemen who saw this experiment were apt to impute the cure rather to the dog's spittle (he licking the wound) than to the virtue of the fat, they caused him to be bit again in the tongue, forbearing the use of the remedy, and he died within four or five hours. Other trials have been made, and with the same success.

A man and his wife, who made it their business to catch vipers, came from Bath to Oxford, and from thence to London ; and, after having shewn a great number of experiments, with respect to the bite of this animal, at last discovered another effectual remedy, which consists in nothing more than chafing the part wounded with olive-oil before the fire ; and, if the case should be extremely bad, wrapping the entire affected limb in a cerate made of white lead and the same oil.

THE GIBOYA.

THIS is the largest of all the Brazilian serpents : Leguat informs us, he has seen one fifty feet in length. The largest of this kind that has been brought into Europe did not exceed thirty-six feet in length. The most usual length, however, of this animal, is about twenty



Rattle Snake



Female Viper



twenty feet, and the thickness in proportion. The teeth are very small in proportion to the body, and this serpent is without venom. It lies in wait for wild animals near the paths, and when it throws itself upon one of them, it winds about it so closely, and with so much strength, that it breaks all its bones, then moistening the whole body over with its slaver, it renders it fit for swallowing whole.

THE RATTLE-SNAKE, THE WHIP-SNAKE, THE ASP, AND THE HOODED SERPENT.

The RATTLE-SNAKE is bred only in America; the usual length is from four to five feet, but they are sometimes seen six feet in length, and as thick as a man's leg. It resembles the viper in many particulars; like that animal, it has a large head and a small neck; it is of a dusky colour, and is furnished with fangs capable of inflicting the most terrible wounds. It has a large scale, which hangs like a penthouse over each eye. The rattle-snake is of an orange, tawny, and blackish colour on the back, and of an ash-colour on the belly. The male may be readily distinguished from the female by a black velvet spot on the head, and by the head being smaller and longer. But what principally distinguishes this serpent is the rattle, an instrument lodged in its tail, by which it makes such a loud rattling noise when it moves, that its approach may be known and the danger avoided. This rattle is composed of several thin, hard, hollow bones, linked to each other, and rattling upon the

lightest motion. The certain death which accrues from the terrible bite of this creature, makes a solitude wherever it is heard. It moves along with majestic rapidity, but never unprovoked attacks any thing but its prey ; yet, when accidentally trod upon, or pursued for its destruction, it makes a most dreadful and desperate defence : it erects the tail, throws back the head, and instantly inflicts its wound ; then parts, and inflicts a second wound ; after which, some travellers assure us, that the animal becomes torpid and inactive, and never even attempts to make its escape. The very instant the puncture is made, it is more painful than the sting of a bee, and this pain grows every moment more excruciating and dangerous : the limb swells, the venom reaches the head, which swells to an enormous size ; the eyes are red and fiery ; the heart beats quick ; the pain becomes insupportable, and some expire under it in five or six hours ; those of strong constitutions may endure the agony a few hours longer, but at last sink under a general mortification.

A gentleman in Virginia trod accidentally upon a rattle-snake, which had been lurking in a stony place ; the enraged animal reared up, bit his hand, and shook its rattles. The gentleman, unwilling to die unrevenged, killed the snake, and carrying it home in his hand, threw it on the ground before his family, crying out, " I am killed, and there is my murderer !" His arm, which was beginning to swell, was immediately tied up near the shoulder, the wound

wound was anointed with oil, and every means employed to stop the infection. His arm, below the ligature, appeared of several colours; all the muscles were in motion, a fever ensued; after that the loss of his hair, giddiness, drought, weakness, and nervous faintings; till, by slow degrees, a very strong constitution overpowered the latent malignity of the poison, and he recovered, but not without feeling the most various and dreadful symptoms for several weeks afterwards.

Many have affirmed that the rattle-snake has the power of charming squirrels, hares, birds, and other animals, in such a manner as to make them run directly into its mouth. In Pennsylvania, this serpent is often seen basking at the foot of a tree; there, coiled upon its tail, its jaws extended, and its eyes shining like fire, it levels its dreadful glare upon its prey; the little animal is incapable of breaking through the fascination, it advances towards the serpent with seeming reluctance; at length, as if overcome by the potency of its fears, it jumps into the throat of its frightful destroyer.

The WHIP-SNAKE is still more venomous than the rattle-snake. It is a native of the East, and is about five feet in length, though it is not much thicker than the thong of a coachman's whip; from whence it has its name.

The ASP is also a very formidable serpent, but its bite is not attended with those drowsy symptoms which the ancients ascribed to it.

The COBRA DI CAPELLO, OR HOODED SERPENT, inflicts the most deadly and incurable wounds: there are five or six different kinds of this formidable creature, which are all equally dangerous, a speedy death being the certain consequence of their bite: it is said, the patient will die in about an hour after the wound is given, the whole frame being dissolved into one putrid mass of corruption. This animal is from three to eight feet long, with two large fangs hanging out of the upper jaw.

THE SNAKE.

THIS is the largest of the English serpents, and is sometimes found upwards of four feet in length: the neck is slender, the middle of the body thick, the back and sides covered with small scales, the belly with oblong narrow transverse plates. The back and sides of the snake are of a dusky brown. This species has a spot of pale yellow on each side of the neck; it is perfectly inoffensive, taking shelter in dunghills, and among bushes in moist places. It will readily take the water, and swims very well, its whole length generally appearing on the surface of the water. In summer the snake is invited out by heat to bask itself in the sun. If disturbed, they move swiftly away among the brambles; and, if too closely pursued, will hiss and threaten, and, though incapable of offending, will thus render themselves formidable. The snake preys upon frogs, insects, worms, and mice. During the winter it lies torpid

torpid under old trees, or in the banks of hedges.

THE BLIND WORM.

LIKE the snake, the blind worm is a very inoffensive reptile, with a formidable appearance. The usual length of this species is about eleven inches; the head small, the neck very slender; the body grows suddenly from the neck, and continues of an equal bulk to the tail, which is blunt at the end. The back is ashi-coloured, marked with very small lines composed of minute black specks; the sides are reddish, and the belly dusky, marked in the same manner as the back. This serpent is slow in its motions, on which account, together with the smallness of its eyes, it obtained its names; some calling it the *slow*, and others the *blind* worm. Like other serpents in our climates, it lies torpid during winter, and many of them are sometimes found twisted together. Like the viper, this animal brings forth its young alive.

INSECTS.

OF INSECTS IN GENERAL.

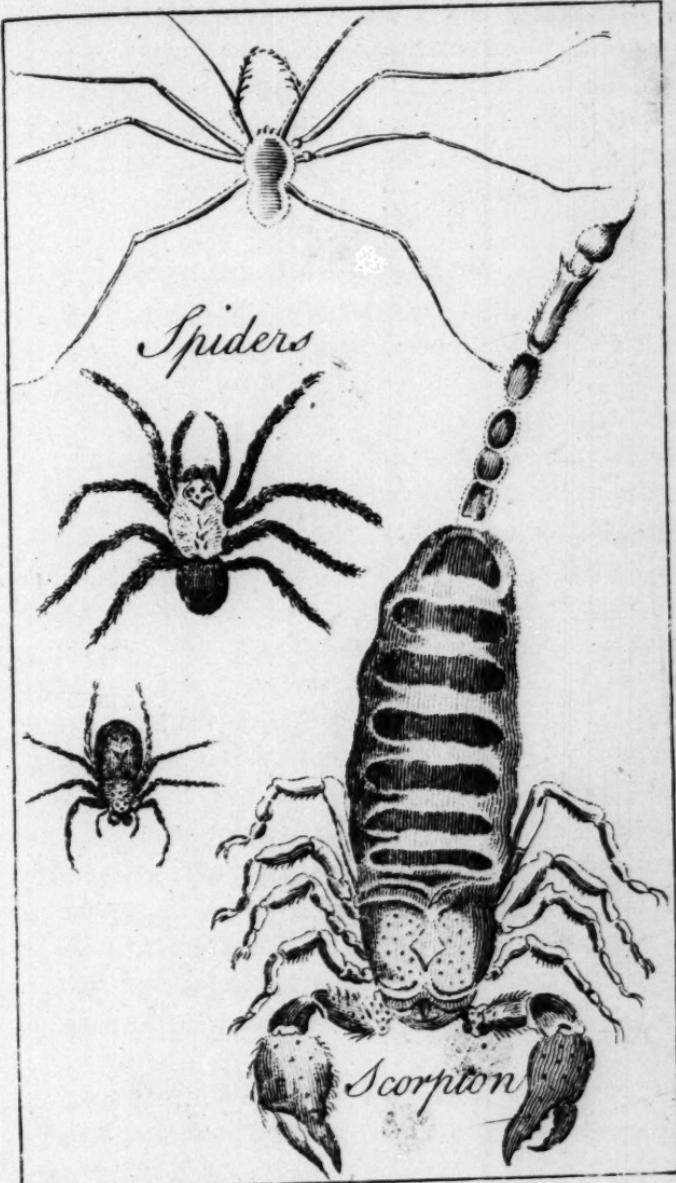
INSECTS may be defined to be little animals without red blood, bones, or cartilages, furnished either with a trunk, or a mouth opening

opening lengthwise, with eyes which they are incapable of covering, and with lungs which have their openings on the sides. The whole class of insects is comprehended in this definition.

THE SPIDER.

THE most subtle of all insects is the spider: formed for a life of rapacity, all its habits are calculated to deceive and surprise. In this island, where all the insect tribes are kept under by human assiduity, the spiders are small and inoffensive. The chief of our native spiders are the **HOUSE-SPIDER**, which weaves its web in neglected rooms; the **GARDEN-SPIDER**, which extends its web from tree to tree, and reposes in the center; the **WANDERING-SPIDER**, that has no fixed abode, and the **FIELD-SPIDER**, which sometimes mounts, web and all, into the clouds. These are all reputed venomous, but they are perfectly harmless. In Africa and America the tribe of spiders are much more terrible. The bottom of a Martinico spider's body is as large as a hen's egg, and covered with hair; its web is strong, and its bite is dangerous. We are happily placed at a distance from these formidable creatures, and are satisfied with the history of them, without wishing to approach them.

Every spider has two divisions in its body; the fore-part contains the head and the breast, and is separated from the belly or hinder part by a very slender thread, which, however, forms a connection between the two parts: the





the fore-part is furnished with a hard shell, as well as the legs, which adhere to the breast: they have brilliant eyes all round the head; some are possessed of eight, and others only six; two are placed before, two behind, and the rest on each side. As these animals procure their subsistence by the most watchful attention, so many eyes are necessary to give it the earliest information of the capture of its prey. On the fore-part of the head they have two pincers strong pointed, and ferrated, and terminating in claws. A small hole is seen below the point of the claw, through which it emits a poison, which, though harmless to us, instantly destroys their prey. They have all eight legs, jointed like those of lobsters, and, like them, if a joint is lost, they are quickly supplied with a new one. Besides the eight legs already mentioned, spiders are furnished with two others, which may not improperly be called arms, as they do not serve to assist motion, but are used in managing their prey.

As the spider lives wholly upon flies, and is destitute of wings to pursue them, it becomes an experienced hunter, and spreads a net to catch those animals it is unable to pursue: its web is generally laid in those places where flies usually resort; there it remains in patient expectation for days and weeks together, seldom changing its situation. To fabricate this web, Nature has supplied the spider with a large quantity of glutinous matter within its body, and five teats for spinning it into thread: the threads which we see spun from these teats, and

aad which appear so fine, are, nevertheless, composed of five joined together, and these are many times doubled when the web is in formation.

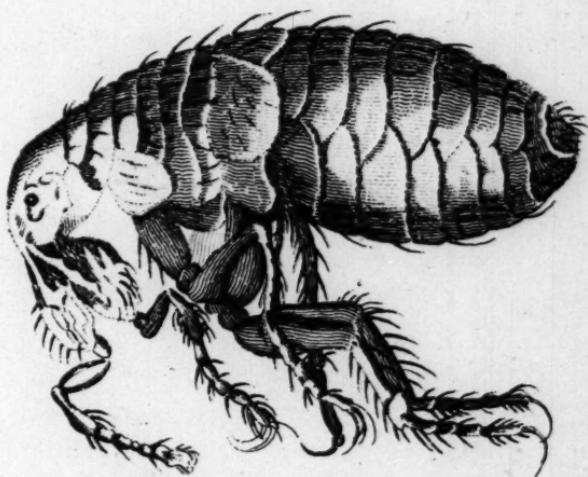
The female spider generally lays from 900 to 1000 eggs in a season; they are of a blueish colour, speckled with black, and are large or small in proportion to the size of the animal that produces them.

Of this animal there are several kinds, slightly differing from each other, either in habits or conformation, but varying considerably in size: the STREAKED SPIDER is speckled with black all over its body and legs: the CARTER, or long-legged spider, has legs of an extraordinary length, and there is no distinction of the back and belly part, for the whole body appears to be nearly round.

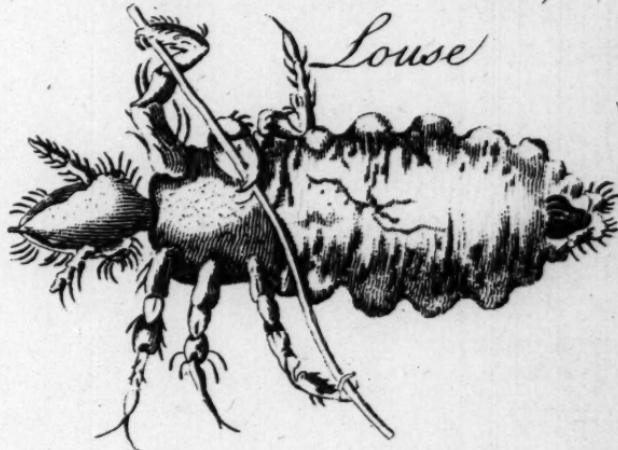
THE TARANTULA.

THIS animal has some resemblance to the house spider, but is the largest yet known in Europe. It is a native of that part of Italy called Apulia. The body is about three quarters of an inch in length, and about the thickness of a man's little finger; it is generally of an olive brown, variegated with a dusky colour; it has eight legs, eight eyes, and sharp nippers; between these and the fore-legs there are two little horns or feelers, which it moves very briskly when it approaches its prey. Its body is covered with a kind of soft down, and it propagates, like other spiders, by laying eggs. In the summer months, the tarantula creeps

Flea



Louse





creeps along the corn, and bites the passengers and mowers, but in winter it lurks in holes, and is very seldom seen. Though the bite of this animal is attended with no dangerous symptoms, and will easily cure of itself, wonderful stories are reported concerning its virulence. The person bit, it is said, does nothing but laugh, dance, and skip about, putting himself into the most extravagant postures ; this is succeeded by a most frightful melancholy, and at length the symptoms terminate in death. Some travellers into Italy affirm, that this extraordinary malady is only to be cured by music, and particularly by the violin. The medical musician begins with a particular tune, celebrated for the cure ; the patient begins to dance, and continues dancing till he is all over in a strong perspiration, which forces out the venom that appeared so dangerous. Swammerdam, however, assures us, that even in Apulia this story is looked upon as entirely fabulous, and is kept up as a vulgar error by some strolling musicians, who obtain a livelihood by playing the supposed venom away.

THE FLEA.

VERY few are ignorant of the agility and blood-thirsty disposition of the flea ; it is not only the enemy of mankind, but of the dog, cat, and several other animals, and is found in every part of the world. The flea has a small head, large eyes, and a roundish body : it has feelers, or horns, which are short, and composed of four joints, between which its trunk

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is situated, which it buries in the skin, and through which it sucks the blood in large quantities. When beheld through a microscope, it appears to be curiously adorned with a suit of polished table armour, elegantly jointed, and beset with great numbers of sharp pins, resembling the quills of a porcupine. It has a piercing round black eye ; it is furnished with six legs, which are so contrived, that it can fold them up one within another, and, when it leaps, they all spring out at once, whereby its whole strength is exerted, and it can raise itself to an extraordinary height.

THE LOUSE.

THE louse is the enemy of man in the most odious degree, for whether wretchedness, disease, or hunger, seize upon him, the louse seldom fails to add itself to the tribe, and to increase in proportion to the number of his calamities. In examining the louse with a microscope, its external deformity strikes us with disgust. The annexed figure represents it climbing on a hair with its belly upwards. It is a creature of a very odd form, having a head shaped like that expressed in the figure ; on either side, behind the head (being the place where other creatures ears stand) are placed its two black, shining, goggle eyes, looking backwards, and fenced round with several small hairs that encompaſſ it. It has two horns that grow before it, in the place where one would have thought the eyes should be ; each of these has four joints, which are fringed, as

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it were, with small bristles; the head seems very round and tapering, ending in a very sharp nose, which seems to have a small hole, and to be the passage through which he sucks the blood. It hath six legs, covered with a very transparent shell, and jointed exactly like a crab's or lobster's; each is divided into six parts by these joints, and those have here and there several small hairs; at the end of each leg it has two claws, very properly adapted for its peculiar use, being thereby enabled to walk very securely both on the skin and hair. The belly is covered with a transparent substance likewise; for it is grained all over the belly, just like the skin in the palm of a man's hand.

THE BUG.

THIS also is a nauseous insect, which intrudes upon the retreats of mankind. The night is usually the season when the wretched have rest from their labour, but this seems the only season when the bug issues from its retreats to make its depredations. It cunningly avoids the light; but, when darkness promises it security, it issues from every corner of the bed, and greedily attacks its prey. Happily, however, for Great Britain, they multiply less in that island than in any part of the continent: in France and Italy the beds swarm with them; and in those countries they grow larger, and bite with a more cruel appetite than they do with us.

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This animal consists of three principal parts; the head, the corselet, and the belly. It has two feelers, with three joints; beneath these there is a crooked trunk, which is its instrument of torture, and which lies close upon the breast when it is in motion: the breast is a kind of ring, and the belly consists of nine rings: it has six legs: its body is smooth, except that it has a few short hairs near the vent, which may be seen by the microscope: its motion is slow and unwieldy. The smell of this insect, when killed, is intolerable.

THE WOOD-LOUSE.

THIS insect seldom exceeds half an inch in length, and a quarter of an inch in breadth. Those found about dunghills, and on the ground, are usually of a livid black; but those found under timber, tiles, and in drier places, are of a lighter colour. It has two short feelers, and the body is of an oval shape. When touched, it rolls itself up into a kind of ball; and the sides, near the feet, are dentated like a saw. Wood-lice have great medicinal virtues, being impregnated with a saline quality, which is diuretic and stimulating.

THE MONOCULUS, OR WATER FLEA.

WATER FLEAS are of a blood colour, and are sometimes seen in such multitudes on the surface of standing water, that many people have taken it for blood. It is peculiar to the water, and has the legs before divided into

branches, with which it either swims or leaps, and the body is covered with a crust or shell. It appears to have but one eye.

THE SCORPION.

THIS is one of the largest of the insect tribe, and is not less terrible from its size than its malignity. Its shape somewhat resembles that of a lobster, but is infinitely more hideous. Nine different kinds of this dangerous insect have been enumerated; but they are principally distinguished by their colour: some are yellow, others brown; some are of an iron grey, and others are black, red, and white. The head of the scorpion seems to be joined to the breast, in the middle of which are seen two eyes, and two others are placed more forward in the fore part of the head; these eyes are so small as to be almost invisible. On each side of the head are two arms, each composed of four joints, the last of which is large and strong, and resembles a lobster's claw. Below the breast are eight articulated legs, each divided into six joints, and the two hindmost of which are each provided with two crooked claws. The belly is divided into seven little rings, and the tail is composed of six joints, which are bristly, and appear like little globes; the last being armed with a crooked sting: this is that fatal instrument which renders this insect so truly mischievous and formidable. As it generally takes shelter in houses, it frequently stings those among whom it resides. In some of the towns of Italy, and in the province of

Languedoc in France, it is one of the greatest pests that torment mankind: but by the natives of Africa and the East, their malignity is woefully experienced. In Batavia, where they grow twelve inches long, a piece of furniture cannot be moved in the house without the utmost danger of being stung by them. We are assured by Bosman, that, along the Gold Coast, they are frequently seen larger than a lobster, and that their sting is inevitably fatal. In Europe, however, they are neither so plentiful, so large, nor so venomous. There it seldom exceeds two or three inches in length, and its sting is not often fatal.

THE LEACH.

THE common leach is a water insect; it has the general figure of a worm, and is about as long as a man's middle finger. Its skin is composed of rings, by means of which it swims with some agility in the water. When out of water it contracts itself in such a manner, that, when touched, it is not above an inch long. It has a small head, and a black skin, edged with a yellow line on each side; the belly is of a reddish colour, marked with whitish yellow spots. It is remarkable, that the mouth of this animal can assume whatever form it finds convenient. When at rest, however, the opening is usually triangular, and within it are placed three very sharp teeth. These animals are very useful in medicine, and when they are applied, they should be taken from the water in which they are contained about an hour before,

fore, for they thus become more voracious, and fasten more readily. The most remarkable particular of this animal is, that though it takes a large quantity of food, it has no passage to eject it from the body when it has been digested: it is supposed to go off through the pores of the body.

The *horse-leach* is larger than the former, and grows to four inches in length. It has a smooth glossy skin, black on the back, spotted with grey. It is of no use, as it will not stick to the skin.

THE GRASS-HOPPER AND THE LOCUST.

THERE are a tribe of little animals, which, though differing in size and colour, strongly resemble each other in figure, appetite, and nature. Of this variegated tribe, the common grass-hopper, that is found in such plenty in every meadow, and that continues chirping through the summer, is best known to us; and a history of that will contain a history of all the rest. The colour of this animal is green, with a line of brown which streaks the back, and two pale lines under the belly and behind the legs. The head is oblong, in some degree resembling that of a horse. The mouth is armed with teeth of a brown colour, hooked at the point. The corset is elevated, narrow, armed above and below by two serrated spines. The back is armed with a strong buckler. The last pair of legs are longer and stronger than the first two pair, fortified by thick muscles, and admirably formed for leaping. It has four

wings ; the belly is composed of four rings, and terminated by a forked tail.

The grass-hopper, though seemingly without wings, is in reality possessed of them from the first, but it cannot break the bonds by which they are folded up, till it has been excluded above twenty days. When arrived at their winged state they are still vocal, and in the midst of summer are heard much louder at sun-setting than during the heat of the day. Though slow in flight, they are sometimes seen to fly to considerable distances.

The larger kinds differ from this only in size, rapidity of flight, and the powers of injuring mankind, by warming upon the productions of the earth. The grass that is destroyed by a few grass-hoppers which sport in our fields can be of no great consequence ; but when a swarm of locusts, two or three miles in length, and several yards in depth, settle upon a field, the consequences are frightful.

The great West Indian locust is the most noxious of this tribe of animals : it is armed with a sting, and those who touch it are sure to be stung by it : a little palm-oil, however, is a certain cure for it.

THE CRICKET.

THIS insect resembles the grass-hopper in its shape, its voice, and its leaping ; but its colour is uniformly of a rusty brown : its residence is most usually in the warmest chinks behind a country hearth : it is of a most chilly nature, seldom quitting the fire-side : it is a voracious

voracious little animal, and will eat sugar, bread, meat, or flour. Except in the very coldest weather, they never cease their chirruping.

THE EARWIG AND THE FROTH INSECT.

THE earwig is so common as hardly to require a description: it is equally remarkable for its swiftness in the reptile state, and its velocity when it has arrived to its winged state. It is very prolific and very harmless. The name and the deformity of its figure have subjected it to an imputation which has often procured its destruction. It is said, that it often enters into the ears of people sleeping, thus causing madness from the intolerable pain, and soon after death itself; these reproaches, however, are entirely groundless. Their highest offence is that of destroying garden plants.

THE CATERPILLAR, BUTTERFLY, AND MOTH.

CATERPILLARS are readily distinguished from worms or maggots by the number of their feet, and by their producing butterflies or moths. All this class have from eight to sixteen feet, and the animal into which they are converted is always a butterfly or a moth. It is well known, that all these little animals are hatched from the eggs of butterflies, and, during winter, the greatest number of caterpillars are in an egg state. When it has strength to break

break its shell, it always finds its favourite alien-
ments provided in abundance before it.

The body of a caterpillar is composed of rings, which are generally twelve in number; by which they may be distinguished from any other insects that resemble them. The head is connected to the first ring by the neck; the jaws are placed rather vertically, and each jaw is armed with a large thick tooth: with these the animals devour their food in amazing quantities. A single caterpillar will eat double its own weight of leaves in a day, without appearing to be disordered by the meal.

With regard to their external figure, caterpillars are either smooth or hairy; they have in general six small black spots on the circumference of the fore-ring, three of which are larger than the rest, which Reaumur supposes to be eyes. This insect has nine holes on each side of the body, through which it is supposed to breathe; they are called the stigmata.

The life of the caterpillar seems to be one continued succession of changes, and, before the great metamorphosis, changes its skin eight or ten times: at length it becomes an aurelia, and one would imagine, that they were conscious of the precise time of their continuance in their aurelia state; their little sepulchres, with respect to their solidity, being proportioned to such duration. At length the butterfly bursts from its aurelia skin, and decorates our fields with its symmetry and beauty.

THE SILKWORM.

THE silkworm is a large caterpillar of a whitish colour, with twelve feet, and is afterwards transformed into a butterfly of the moth kind: the cone on which it spins is formed for covering it while it remains in the aurelia state; and several of these, when properly wound off and united together, form those strong and beautiful threads which are woven into silk: and, as our luxuries are increased, the silk manufacture is become one of the most lucrative of any in the southern provinces of Europe.

Previous to spinning its web, the silkworm seeks for a convenient place to erect its cell without any obstruction. Having found a leaf, or a chink fitted to its purpose, it begins to writh its head in every direction, and fastens its thread on every side to the sides of its retreat.

In the course of a fortnight or three weeks the aurelia is changed into a moth: no sooner is the winged insect completely formed, than, having divested itself of its aurelia skin, it prepares to burst through its cone, or outward prison, and by repeated efforts becomes emancipated. This animal, in its fly state, seems produced for no other purpose than to transmit a future brood: it neither flies nor eats, the male only seeking the female; their union continues for about four days without interruption; the male then dies, and the female survives him only till she has laid her eggs, which, in the ensuing spring, are hatched into worms.

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THE BEE.

THE bee is a small and well-known insect, famous for its industry.

This useful and laborious insect is divided by two ligaments into three parts or portions, the head, the breast, and the belly. The head is armed with two jaws and a trunk, the former of which play like two jaws opening and shutting to the right and left. The trunk is long and taper, and, at the same time, extremely pliant and flexible, being destined by nature for the insect to probe to the bottom of the flowers, through all the impediments of their chives and foliage, and drain them of their treasured sweets. From the middle part or breast of the bee grow the legs, which are six in number; and at the extremity of the paws are two little hooks, discernible by the microscope, which appear like flicles, with their points opposite to each other. The wings are four, two greater and two smaller, which not only serve to transport them through the air, but, by the noise they make, to give notice of their departure and arrival, and to animate them mutually to their several labours. The hairs with which the whole body is covered, are of singular use in retaining the small dust that falls from the chives of the flowers, of which the wax is formed. The belly of the bee consists of six rings, which slide over one another, and may be lengthened or contracted at pleasure; and the inside of this part of the body contains the intestines, the bag of honey,

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the bag of poison, and the sting. The office of the intestines is the same as in other animals. The bag of honey is transparent as crystal, containing the sweet juices extracted from flowers, which the bee discharges into the cells of the magazine for the support of the community in winter. The bag of poison hangs at the root of the sting, through the cavity of which, as through a pipe, the bee ejects some drops of this venomous liquor into the wound, and so renders the pain more excessive. The mechanism of the sting is admirable, being composed of two darts, inclosed within a sheath that tapers into a fine point, near which is an opening to let out the poison. The two darts are ejected through another aperture, which, being armed with several sharp beards like those of fish-hooks, are not easily drawn back again by the bee; and indeed she never disengages them, if the wounded party happens to start and put her into confusion; but if one can have patience to continue calm and unmoved, she clinches those lateral points round the shaft of the dart, by which means she recovers her weapon, and gives less pain to the person stung. The liquor which at the same time she infuses into the wound causes a fermentation, attended with a swelling, which continues several days; but that may be prevented by immediately pulling out the sting, and enlarging the puncture, to let the venomous matter have room to escape.

Let us now consider the generation, polity, and labours of these insects, the true knowledge

ledge of which is very much owing to the modern invention of glass hives, through which all the secrets of the community are laid open to a curious observer. Any person who carefully examines a hive at different seasons of the year, will distinguish three sorts of bees; of which the far greater number are the common working bees, who do all the business of the hive, and seem to be neither male nor female. The second sort, called drones, are the males, and somewhat larger than the former; they have no sting, nor ever stir from the hive, but live upon the honey prepared by the others. The third sort is a much larger and longer-bodied bee, of which there are often but one in every swarm or colony of young bees, who are from time to time detached from the hive in search of another habitation. This large bee is what the ancients called the king, from the respect they always saw paid to it by the other bees; but being the female, the moderns more properly give it the title of queen, or mother of the swarm.

When these industrious insects begin their works, it is observed they divide themselves into four parties, one of which is destined to the fields to provide materials for the structure; the second works upon those materials, and forms them into a rough sketch of the dimensions and partitions of the cells; the third examines and adjusts the angles, removes the superfluous wax, polishes the work, and gives it its necessary perfection; and the fourth is em-

employed in bringing provisions to the labourers that build them, because polishing is not so laborious. They begin their work at the top of the hive, continuing downwards to the bottom, and from one side to another; and to make it the more solid they use a sort of tempered wax, resembling glue. The form of the cells of the honey-comb is hexagonal, which figure, besides what is common with a square and equilateral triangle, has the advantage of including a greater space within the same surface.

The expedition of the bees in their labour is almost incredible; for, notwithstanding the elegance and just proportions of the work, they are so indefatigable, that they will, in one day, finish a honey-comb a foot long, and six inches broad, capable of receiving 3000 bees.

When the cells are completed, the queen takes possession of those she likes best to deposit her eggs in, and the rest are left to be filled with honey. She lays one egg in each cell, and sometimes more than an hundred of those eggs in a day; but what is still more remarkable, she lays those eggs which are to produce common bees in cells of the common shape and size, those that are to become drones or males, in the cells of a larger size, and deposits those which are to become females, like herself, in the spheroidal cells already described.

These eggs, after lying some time in the cells, are hatched into maggots, and fed with honey ten or twelve days, after which the other bees close up the cells with a thin piece of wax; and under this covering they become

gradually transformed into bees, in the manner as silkworms are into butterflies. Having undergone this change, the young bees pierce through their waxen doors, wipe off the humidity from their little wings, take their flight into the fields, rob the flowers of their sweets, and are perfectly acquainted with every necessary circumstance of their future conduct. As to the males, or drones, which are destined only to propagate their species, they live very comfortably for about three months after they are hatched ; but when that time is over, and the females are impregnated, the common bees either kill them or drive them from the hive, as burdensome to the community, and not a drone is to be found till the next season.

It is an excellent observation of a modern author, that the hive is a school to which numbers of people ought to be sent ; prudence, industry, benevolence, public spiritedness, œconomy, neatness, and temperance, are all visible among the bees. These little animals are actuated by a social spirit, which forms them into a body politic, intimately united, and perfectly happy. They all labour for the general advantage ; they are all submissive to the laws and regulations of the community : having no particular interest, no distinction but those which nature or the necessities of their young have introduced amongst them. They are free, because they only depend on the laws ; they are happy, because the concurrence of their several labours inevitably produces abundance, which contributes to the riches of each individual.

When the hive is become too much crowded, by the addition of the young brood, a part of the bees think of finding themselves a more commodious habitation, and with that view single out the most forward of the young queens. A new swarm is, therefore, constantly composed of one queen at least, and of several thousand working bees, as well as of some hundreds of drones. The working bees are some old, some young.

The usual method of uniting swarms is very easy. Spread a cloth at night upon the ground close to the hive in which the two casts or swarms are to be united; lay a stick across this cloth; then fetch the hive with the new swarm, set it over the stick, give a smart stroke on the top of the hive, and all the bees will drop down upon the cloth in a cluster. This done, throw aside the empty hive, take the other from off the stool, and set this last over the bees, who will soon ascend into it, mix with those already there, and become one and the same family. Others, instead of striking the bees down upon a cloth, place with its bottom upmost a hive in which the united swarms are to live, and strike the bees of the other hive down into it. The former of these hives is then restored to its natural situation, and the bees of both hives soon unite. If some bees still adhere to the other hive, they may be brushed off on the cloth, and they will soon join their brethren. Or we may take the following method, which gives less disturbance to the bees: set with its mouth upmost the

hive into which the young swarm has been put, and set upon it the other hive. The bees in the lower hive, finding themselves in an inverted situation, will soon ascend into the upper.

Columella directs, that the apiary, or bee-garden, face the south, in a place neither too hot, nor too much exposed to the cold; that it be in a valley, in order that the loaded bees may with the greater ease descend to their homes; that it be near the mansion-house, on account of the conveniency of watching them, but so situated as not to be exposed to noisome smells, or to the din of men or cattle; that it may be surrounded with a wall, which, however, should not rise above three feet high; that, if possible, a running stream be near them, or, if that cannot be, that water be brought near them in troughs, with pebbles or small stones in the water, for the bees to rest on while they drink; or that the water be confined within gently declining banks, in order that the bees may have safe access to it, they not being able to produce either combs, honey, or food for their maggots, without water. That the neighbourhood of rivers, or basons of water with high banks, be avoided, because winds may whirl the bees into them, and they cannot easily get on shore from thence to dry themselves; and that the garden in which the apiary stands be well furnished with such plants as afford the bees plenty of good pasture. The trees in this garden should be of the dwarf kind, and their heads bushy, in order

der that the swarms which settle on them may be the more easily hived.

We come now to explain the most inhuman method commonly practised of taking bees, which consists in wantonly destroying the whole swarm, in order to enjoy the fruits of their labours.

Were we to kill the hen for her egg, the cow for her milk, or the sheep for the fleece it bears, every one would instantly see how much we should act contrary to our own interest: and yet this is practised every year in regard to bees. Would it not argue more wisdom in us, to be contented with taking away only a portion of their wax and honey, as is the practice of many countries? The common method here is, that when those which are doomed for slaughter have been marked out (which is generally done in September) a hole is dug near the hive, and a stick, at the end of which is a rag that has been dipped in melted brimstone, being stuck in that hole, the rag is set on fire, the hive is immediately set over it, and the earth is instantly thrown up all around, so that none of the smoke can escape. In a quarter of an hour all the bees are seemingly dead, and they will soon after be irrecoverably so, by being buried in the earth that is returned back into the hole: We say, they will soon be absolutely killed by these last means, because it has been found by experiment, that all the bees which have been affected only by the fume of the brimstone recover again, excepting such as have been singed or hurt by the flame. Hence

it is evident, that the fume of brimstone might be used for intoxicating the bees, with some few precautions. The heaviest and the lightest hives are alike treated in this manner; the former, because they yield the most profit, with an immediate return; and the latter, because they would not be able to survive the winter. Those hives which weigh from fifteen to twenty pounds are thought to be the fittest for keeping.

The indefatigable Mr. Wildman, so universally known for his curious experiments with bees, has obliged the world with the following method of taking the wax and honey, without destroying the bees:

Remove, says he, the hive from which you would take the wax and honey into a room, into which admit but little light, that it may at first appear to the bees as if it were late in the evening. Gently invert the hive, placing it between the frames of a chair, or other steady support, and cover it with an empty hive, keeping the side next the window of the empty hive raised a little, to give the bees sufficient light to get into it. While you hold the empty hive steadily supported on the edge of the full hive, between your side, and your left arm, keep striking with your other hand all round the full hive from top to bottom, in the manner of beating a drum, so that the bees may be frightened by the continual noise from all quarters; and they will, in consequence, mount out of the full hive into the empty one. Repeat the strokes rather quick than strong round

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the hive till all the bees are got out of it, which will generally be in about five minutes. It is to be observed, that the fuller the hive is of bees, the sooner they will have left it. As soon as a number of them have got into the empty hive, it should be raised a little from the full one, that the bees may not continue to run from the one to the other: and as soon as all the bees are out of the full hive, the other, in which the bees are, must be placed on the stand from which the former hive was taken, in order to receive the absent bees as they return from the fields.

If this be done early in the season, the operator should examine the royal cells; for if any of them contain young bees, they must, as well as all the combs that have young bees in them, be saved in the hive. Take out the other combs with a long, broad, and pliable knife, cutting them from the sides and crown as clean as possible, to save the future labours of the bees, who must lick up the honey spilt, and remove every grain of wax: the sides of the hive should then be scraped with a table-spoon, to clear away what was left by the knife.

Having thus finished taking the wax and honey, let a table covered with a clean cloth be placed near the stand, and giving the hive in which the bees are a sudden shake, striking it at the same time pretty forcibly, the bees will be shaken on the cloth. Put their own hive over them immediately, raised a little on one side, that the bees may more easily enter, and when all are entered, place it on the stand as

as before. If the hive in which the bees are be turned uppermost, and their own hive placed over it, the bees will immediately ascend into it, especially if the lower sides be struck to alarm them: for the effects of fear impressed on the bees by the continual noise, renders them for a considerable time so mild and tractable, that they will bear any handling which does not hurt them, without any shew of resentment.

THE WASP AND HORNET.

THOUGH the bee and the wasp resemble each other very strongly, yet they differ very widely in their manner and duration. The wasp is well known to be a winged insect with a sting; it is longer in proportion than the bee, and is marked with bright yellow circles round the body: it is the swiftest and most active insect of all the fly kind: it has a long tooth on each side of the mouth, with which it is enabled to cut almost any substance, and carry it to its nest.

The wasps of Europe are very mischievous, but they are innocent when compared to those of the tropical climates, where all the insect tribes are not only numerous, but large, voracious, and formidable. In some of the islands no precautions can prevent their attacks, and their sting is sometimes as terrible as that of a scorpion.

The hornet is about twice as large as the wasp, but strongly resembles it in shape: it has four wings, those above being double the size

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of those below: it makes a greater noise in flying than a wasp, and is a very troublesome and dangerous insect.

THE ANT.

THESE insects are famous from all antiquity for their social and industrious habits: they are offered as a pattern of parsimony for the profuse, and of unremitting diligence to the sluggard. It is, however, surprising, that all the writers of antiquity should describe this insect as labouring in the summer, and feasting upon the produce during the winter; it being well known, that they require no supply of winter provisions, as they are actually in a state of torpidity during that season. But this may not, perhaps, be the case in some of the warmer climates, where the winter is mild.

The common ants are of two or three different kinds; some are red, others black; some have stings, others have none. Such as have stings, inflict their wounds with them; such as have not, spurt from their hinder parts an acid, pungent liquor. The body of an ant is divided into the head, breast, and belly. The eyes are black, and under them are two small horns or feelers: the breast is covered with a fine silky hair, from which project six legs, the extremities of each have two small claws: the body is of a brown chesnut colour, somewhat reddish about the belly. Like bees, they are divided into males, females, and the neutral or working tribe. The females are larger than the males, and the working ants are the smallest

smallest of all. The former in general have wings, the latter never have any; and upon them are devolved all the labours that tend to the welfare of the community. The males and females mix with the working multitude, but seem no way to partake in the common drudgeries of the state.

The fond attachment which the working ants shew to the rising progeny is amazing: in cold weather they convey them in their mouths to the very depths of their habitation, where they are less subject to the severity of the season. In a fine day they remove them nearer the surface, where their maturity may be assisted by the warm beams of the sun.

The ants of Africa are of three kinds, the red, the green, and the black; the latter is a formidable insect, and above an inch in length: their sting produces great pain, and their depredations are sometimes extremely destructive. From their hills, which are from six to twelve feet high, they sally out in a body in quest of adventures, and sometimes sheep, fowls, and even rats, are killed and devoured by these merciless insects.

THE BEETLE.

THERE are various kinds of the beetle, all concurring in one common formation of having cases to their wings. Such a covering is the more necessary to these insects, as they sometimes live under the surface of the earth, in holes which are made by their own industry. The May-bug, or door-beetle, is so well known

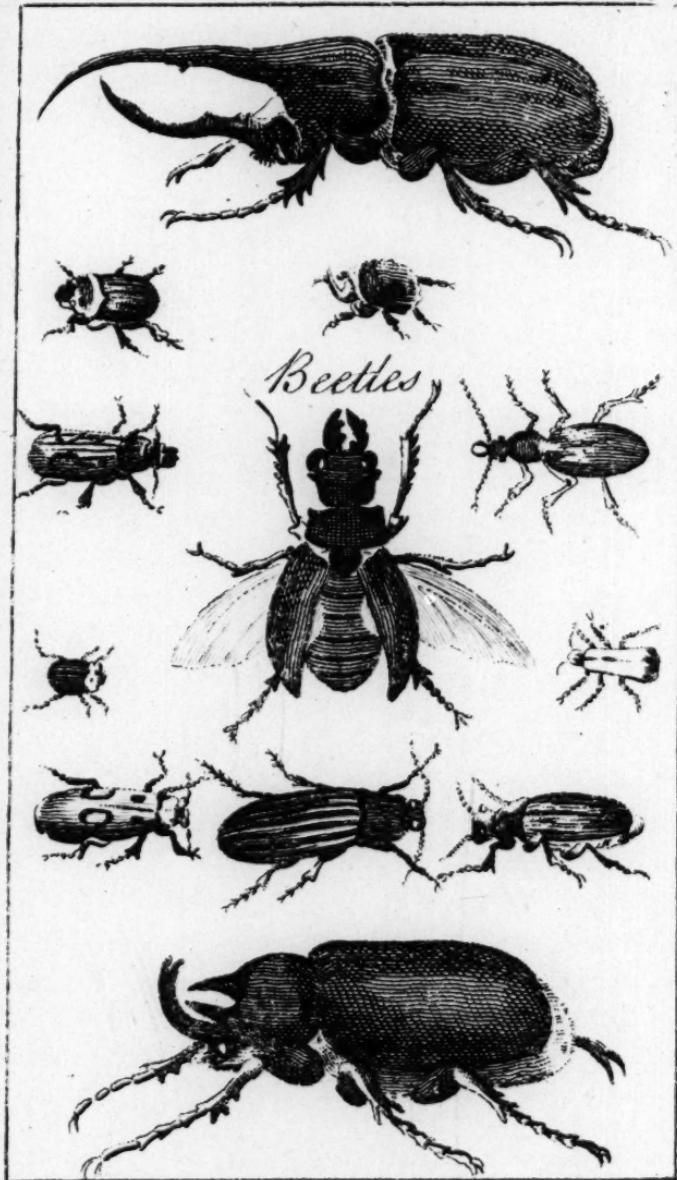


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as to require no description. The elephant beetle is the largest of this kind hitherto known; it is found in South-America, particularly Surinam, and about the river Oronoko. It is black, and the whole body is covered with a hard shell. Its length, from the hinder part to the eyes, is about four inches. The cantharis is of the beetle kind, from whence come cantharides, well known by the name of Spanish flies, and for their use in blisters. Some are of a pure azure colour, others of pure gold, and others of a mixture of both. They are chiefly natives of Spain, Italy, and Portugal. The cochineal is an insect of a scarlet colour within, and without of a blackish red; sometimes of a white reddish or albi-colour, which are accounted the best, and are brought us from Mexico. These insects are used both in dying and in medicine.

THE GNAT AND THE TIPULA.

THE tipula, or long legs, and the larger kind of gnat, have frequently been mistaken for each other; they are both mounted on long legs, both furnished with two wings and a slender body: the principal difference is, that the tipula wants a trunk, and the gnat has a large one, which it often exerts to very mischievous purposes; but the tipula is peaceful and innocent. The gnat of Europe, indeed, gives but little uneasiness; but it is very different in America, where the waters stagnate, and the climate is warm, and where they are produced in multitudes beyond expression.

pression. There they are found from six inches in length to a minuteness that requires even the microscope to perceive them. Though the suffering inhabitants destroy millions daily, still millions more succeed, and produce unceasing torment.

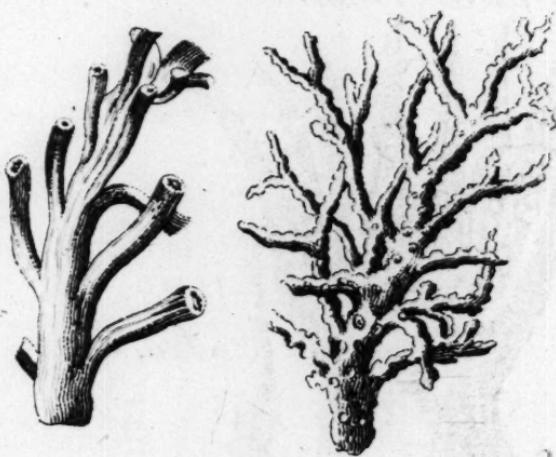
OF WORMS.

ANIMALS of the worm kind are the first in the class of zoophytes: being entirely destitute of feet, they trail themselves upon the ground, and find themselves a retreat under the earth or in the water. Like most other insects, worms have breathing-holes along the back, adjoining each ring, but they are without bones, without eyes, and without ears. Some animals live without their limbs, but the earth-worm, and all the zoophyte tribe, continue to live in separate parts when cut into pieces; and one animal, by the means of cutting, is divided into two distinct existences, and sometimes into a thousand. This is the most astonishing phenomenon in all natural history, that man should have a kind of creative power, and out of one life make two, each completely formed, with all its apparatus and functions. This obtains also in the sea-worm, the water-worm, and in many other of the vermicular species.

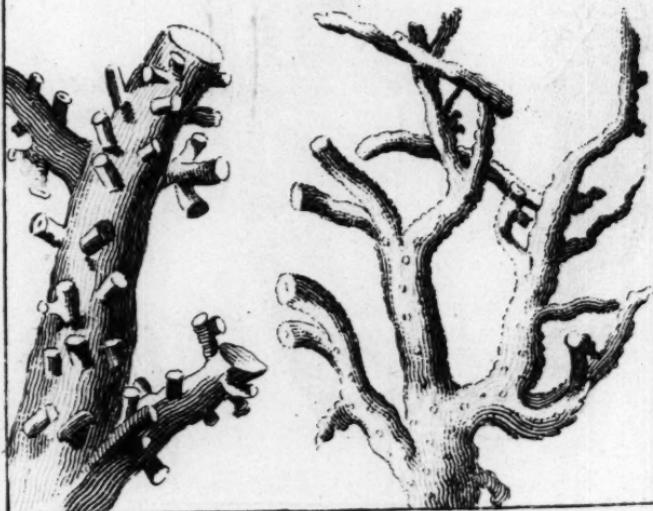
THE STAR-FISH, THE POLIPUS, THE CORAL PLANTS, AND ALL THE VARIETIES OF THE SEA-NETTLE.

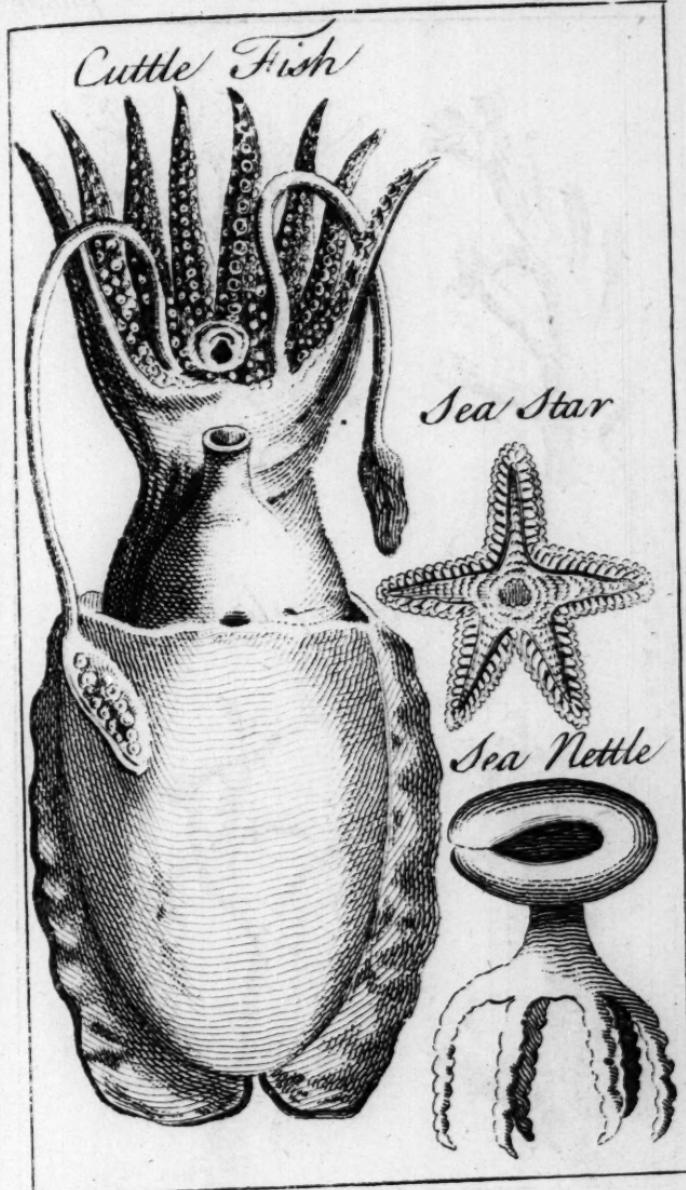
NATURALISTS have given to the worm, and all these animals, the name of zoophytes.





The Coral plants







These are not produced by the ordinary forms of generation, but are propagated by dissection. Some of these, as already observed, though cut into an hundred parts, still retain life in each, and are endued with such a vivacious principle, that every part becomes a perfect animal in a very short time. They are a set of creatures placed between animals and vegetables, and form the shade that connects animal and insensible nature. Such are the scuttle-fish, the sea-star, the sea-nettle, and coral plants. Numbers of what seem plants at sea, are not only the receptacles of insects, but also entirely of insect formation. Hence some philotophers have been led into opinion that all nature was animated, and that the most inert mass of matter was endued with life and sensation, and only wanted organs to make those sensations perceptible to the beholder.

WATERS, EARTHS, FOSSILS, MINERALS, AND VEGETABLES.

OF THE EARTH AND WATERS.

IF we examine into the internal composition of the earth, we shall find, where it has been opened to any depth, it consists of different

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layers or beds, lying horizontally one over the other, like the leaves of a book, each of them composed of materials that increase in weight in proportion as they lie deeper. A very small part of the internal composition of the earth has been the subject of human examination. The mine of Cotteberg, in Hungary, which is supposed to be the deepest in the world, is not above 3000 feet in depth. How insignificant is this, compared to the depth of the terrestrial globe, down to the centre, which is above 4000 miles !

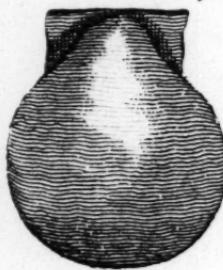
The first layer at the surface of the earth is generally that light coat of blackish mould, sometimes called garden earth. This seems to have been formed from animal and vegetable bodies decaying, and thus turning into its substance. It serves again as a storehouse, from whence animal and vegetable nature are renewed ; and thus are all vital blessings continued with unceasing circulation.

Descending from the surface, if we view the earth cut perpendicularly downwards, we shall find its layers regularly disposed in their proper order. The most common disposition is, that under the first earth is formed gravel or sand, then clay or marle, after that chalk or coal, marbles, ores, sands, gravels, and thus an alternation of these substances, each growing more dense as it sinks deeper.

If we could descend into the bowels of the earth, we should there see dark chambers and apartments, strange subterraneous passages, holes, and caverns ; some filled with smoke and fire,



Streaked Cockle *Sort of Scallop*



Conchites



Streaked Conchites *Oblong Concha*



fire, some with water, and some with vapour and mouldy air; little brooks running murmuring through the dark grottos. A surprising mixture of substances are also found in the internal parts of the earth; masses of petrified wood, brick, wrought metals, beds of sea-shells, trees, and marine bodies; and these not in particular places, but throughout the whole earth; not only in the lower grounds, and hillocks near the shore, but in the highest mountains far distant from the sea, and from the surface of the earth. Various, but very unsatisfactory have been the causes assigned for this. The General Deluge, called Noah's Flood, and the convulsions of the world by earthquakes, bear, however, the strongest marks of probability.

To continue our survey of the earth, we must remember that the land and water, taken together, make one globular body, which is evident from many observations of persons standing on the shore, and viewing a ship departing from the port: they gradually lose sight of the lower part of the vessel, whilst they can still behold the rigging and the streamers at the top; but as the ship proceeds they lose sight of these also, as if the whole was sunk into the deep; in like manner, when a ship is making to land, the mariners first descry the tops of steeples, trees, &c. pointing above the water; the buildings appear next in view, and last of all the shore, which can only be the effect of the earth's rotundity.

The rotundity of the earth is also confirmed by many voyages which have been made about it from east to west.

Having thus briefly treated on the earth, we shall direct our inquiries to the waters. The general term, waters, implies a pellucid fluid, convertible into ice by cold; naturally pervading the strata of the earth, and flowing or stagnating on its surface. Waters may be arranged under two general divisions: 1. The common waters, serving for the ordinary purposes of life. 2. The waters impregnated with peculiar mineral substances.—The differences of common water, arising from the circumstances of stagnation or motion, or of its containing more or less of those stony particles, which it always contains in some degree, are not so essential as to prevent the whole from being considered as of only one kind. On the other hand, the waters impregnated with peculiar mineral substances, differ essentially in regard to the several impregnating matters, and are properly arranged into four kinds: 1. Waters impregnated with metalline particles. 2. Waters impregnated with taline particles. 3. Waters impregnated with sulphureous particles. 4. Waters impregnated with terrene particles.—The waters of the first general kind are used in the common occasions of life, those of the other are taken as medicines to restore decayed health.

Simple water, to use the common phrase, is a pellucid colourless fluid, insipid to the taste, and without smell. We meet with this under different circumstances, and accordingly divide

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it into spring-water, well-water, river-water, pond-water, rain-water, and snow-water. The first is the water furnished us from the bowels of the earth, and is continually fresh supplied: the second is the same water, only with the difference of its remaining long in the same place before we have it: the third is a mixture of the first, and of fresh vapours raised from the sea and fresh waters, and descending in rains. The two first are almost invariably the same; the latter is subject to a thousand changes, from the matters accidentally washed into it by the torrents occasioned by the rains; but it has the advantage of being in continual motion. In its nature, the fourth is much the same with this, but is rather more owing to water that has been raised in vapour, and has fallen again in rain; this has also the disadvantage of standing and stagnating in its place. The fifth has the advantage of being wholly raised in vapour, and, as it were, distilled by nature; it is, consequently, purer than any of the others; but there are so many kinds of particles capable of rising with the water in vapour, that it can never be perfectly pure. The last has all the advantage of this, and the additional one of having been frozen in its passage, and thus having passed through an operation very well calculated for the separating of heterogeneities of many kinds. Upon the whole, the last, or snow-water, bids fair for being the purest and fittest for common use of any that comes in our way; yet even this we have found, by experiments, not to be entirely pure.

Medicinal Waters are such as, exclusive of the sparry, earthy, and crystalline matter contained in all water, are impregnated with other mineral particles, and these either of the metallic or saline kind. These waters are distinguished by two several kinds, as they come forth out of the ground, either hot or cold: the names by which they are called are thermæ and acidulæ: the name of thermæ is properly given to the hot ones, expressing as much; but the other term, acidulæ, is not quite opposite to the cold ones, because they rarely contain an acid salt, but always an alkaline one: it was given them on account of a urinous, or, as some express it, a subacid taste, which many of the cold mineral waters have when fresh drawn from the spring.

Sea-water, on account of its disagreeable taste, is not often given internally, though great advantages arise from it. It is of great use, however, in bathing: cutaneous eruptions of almost all kinds are cured by perseverance in the use of it: tumours and pains of the limbs are also, frequently cured by it; and we find it often recommended as the great medicine against the most terrible of all diseases, the bite of a mad dog.

The benefit which the Almighty designed for man by the tides, in giving a perpetual motion to the waters, was to prevent their corrupting, and thereby breeding any infection that might arise from a too long stagnation of them.

By these diurnal helps of the flux and reflux of the tides, also large ships of burden are conducted

ducted to capital cities, which, without this flowing of the rivers, would be absolutely impracticable.

That water is the most fluid penetrating body, next to fire, and the most difficult to confine, is incontestably proved by a variety of experiments. A vessel through which water cannot pass, may be said to retain any thing. No fire can make water hotter after it begins to boil. Boiling water, therefore, affords a standard fixed degree of heat over the whole world, being as hot in Greenland as upon the coast of Guinea: of heat there are various sorts; one fire is more intense than another; but boiling water is an heat every where the same, and easily procurable *.

OF CLAY.

CLAY, in natural history, is a genus of earths, the characters of which are these: they are firmly coherent, weighty, and compact; stiff, viscid, and ductile to a great degree, while moist; smooth to the touch, not easily breaking between the fingers, nor readily diffusible in water, and when mixed, not readily subsiding from it. Besides the use of clay for making potter's ware, it is a considerable improver of light and sandy grounds, which, unless they are clayed, will bear nothing but rye, with whatever other composts they are manured;

* For a fuller explanation of the numerous and important properties of water, see "RUDIMENTS OF REASON," published by E. Newbery.

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but once clayed, they will produce oats, barley, pease, &c.

OF MARLE.

MARLE is a kind of dry, soft, fossile earth, used for manuring of land. The principal sorts of marle are the white and red. Too much of it thrown on the ground is found to burn it. Marle is burnt like other stone for making of lime. It is a very material circumstance in the marling of land, to find out how much **the** land requires of this manure; and till **experience** has thoroughly shewn this, it is better to err in laying on too little than too much, because the **latter** is a fault not to be remedied. The marle always lies in the bottom of low bogs, and is found by boring with augers made for that purpose. It usually lies at five, seven, or nine feet depth.

LOAMS.

LOAMS are earths composed of dissimilar particles, hard, stiff, dense, and rough to the touch; not easily ductile while moist, readily diffusible in water, and composed of sand, and a tough viscid clay. Of these loams, some are whitish, and others brown or yellow.

OCHRES.

THE earths distinguished by the name of ochres, are those which have rough or naturally dusty substances, are but slightly coherent in their texture, are composed of fine and soft argil-

argillaceous particles, and are readily diffusible in water. They are of various colours, as red, yellow, blue, green, black. The yellow sort are called ochres of iron, and the blue, ochres of copper. These earths are chiefly of use in painting.

OF B O L E S.

BOLES are a genus of earths, moderately coherent, ponderous, soft, and not stiff, and viscid; composed of fine particles, smooth to the touch, easily breaking between the fingers, readily diffusible in water, and freely and easily subsiding from it. Three kinds of boles are ranked among medicinal earths, Armenian, red, and white.

Bole Armeniac is of a pale colour, between red and yellow, smooth and slippery to the touch, somewhat glossy, pure from sand, or any perceptible gritty matter. It readily crumbles betwixt the fingers, and adheres to the tongue. Softened with water, it forms a smooth paste; diluted with a large quantity of water, it remains for a considerable time suspended. Bole Armeniac, like most of the other coloured earths, contains a portion of ferruginous matter, to which its colour is owing. It is likewise impregnated with vitriolic acid, and hence, when mixed with nitre or sea-salt, it extricates the acids of those salts in the fire. This earth is employed medicinally as an astringent or a styptic, both internally and externally.

Red bole, the common sort of this earth, is coarser than the Armenian, and participates more

more largely of iron; hence it is never given internally, unless to cattle.

White bole is brought to us ready washed, and formed into large rolls or cylindric globes, not of a chalky whiteness, but rather of an ashi-colour. Formerly it came only from Tuscany, or the island Elva: at present it is supplied chiefly from Norway, the island Bornholm, or places nearer home. It differs from the two preceding in containing no manifest irony matter, and consequently in wanting their astringency. It has been recommended as an absorbent; but experiments made upon it with acids, shew that it little deserves that character any more than the other boles. Some have a method of recovering the lustre of pearls, especially the Scotch ones, by warming them a little over the fire, and rubbing them with powdered white bole.

OF TRIPOLY.

TRIPOLY is an earthy substance, much used by the lapidaries to polish stones, and by the braziers to clean metalline vessels. It easily breaks between the fingers, and has a taste like that of pumice stone, but with no sandy grittiness. It grows hard in the fire without changing colour.

OF TALC.

TALC is a large class of fossil bodies, composed of broad, flat, and smooth plates, laid regularly upon one another; easily fossil, according to the site of those plates, but not in the

the least so in any other direction: flexible and elastic; bright, shining, and transparent; not giving fire with steel, nor fermenting with acid menstrua, and sustaining the force of a violent fire without calcining.

English talc, so called in the shops, is of a coarse, harsh, rough kind, with an unequal surface, and of a loose brittle texture. It is found in clay and marble pits, as well as among the strata of gravel and the fissures of stone, and will burn into very good plaster; on which account it is usually called the plaster stone. When burned, it is used for cleaning silver lace.

OF AMIANTHUS.

THIS is vulgarly called earth-flax, and is a fibrous, flexible, and mineral substance, composed of short and abrupt filaments. It is a stony concrete, of the talcy kind, though differing from talc in its external appearance. It is neither so bright, so smooth, nor so unctuous, and is not composed of leaves or plates, but of long filaments like flax: it has been spun into cloth, and formed into paper, incombustible and indestructible in the fire. There are some sorts of amianthus whose filaments are rigid and brittle, and others more flexible: the first cannot be spun, or formed into cloth; the latter may, but not without difficulty. This manufacture appears to have been known among the ancients, who, according to Pliny, wrapt the bodies of the dead in amianthine cloths, to preserve their ashes separate from those of the

the funeral pile: a use to which they are still said to be applied among the princes of Tartary.

OF GYPSUM, OR PLASTER STONE.

THIS is a genus of fossils, naturally and essentially simple, not inflammable nor soluble in water, and composed of small flat particles; which form bright, glossy, and in some degree transparent masses; not flexible or elastic; not giving fire with steel, nor fermenting with, or being soluble in acid menstrua, and very easily calcining in the fire. Some of these gypsums are harder and others softer: they are of several colours, as white, grey, red, green, &c. sometimes distinct, and very variously blended together. They are much used in plaster for stuccoing rooms, and casting busts and statues. The hard white gypsum, or plaster of Paris, is chiefly found in France; but there is a soft white gypsum found in many parts of Derbyshire.

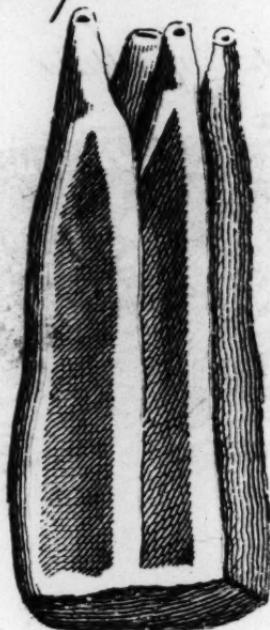
OF THE SELENITES.

THESE are stones consisting of slender fibres, ranged in fine even flakes of different forms, according to their kinds. Like talc, they will cleave not only horizontally but perpendicularly; and though they will bend a little, they have no elasticity. They will not ferment with aqua fortis, nor readily calcine in the fire.

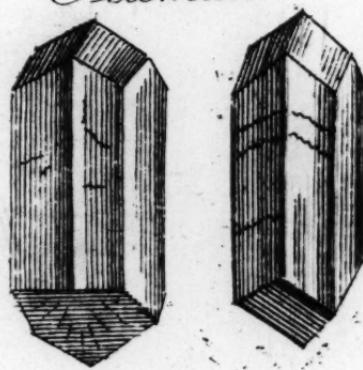
This stone is found in the strata of clay in many parts of England.



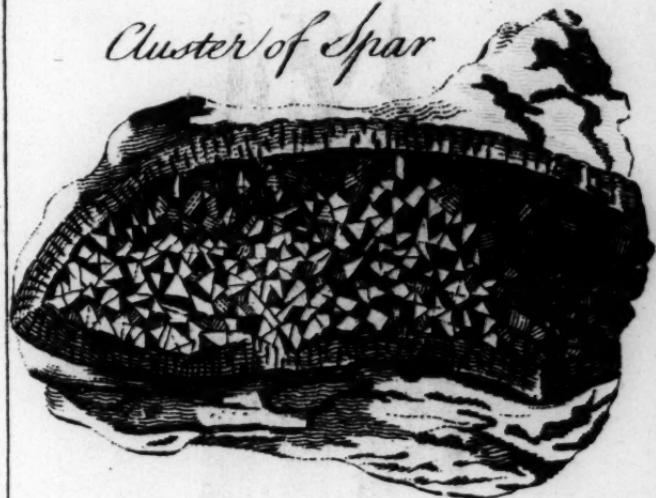
Petrification



Selemites



Cluster of Spar



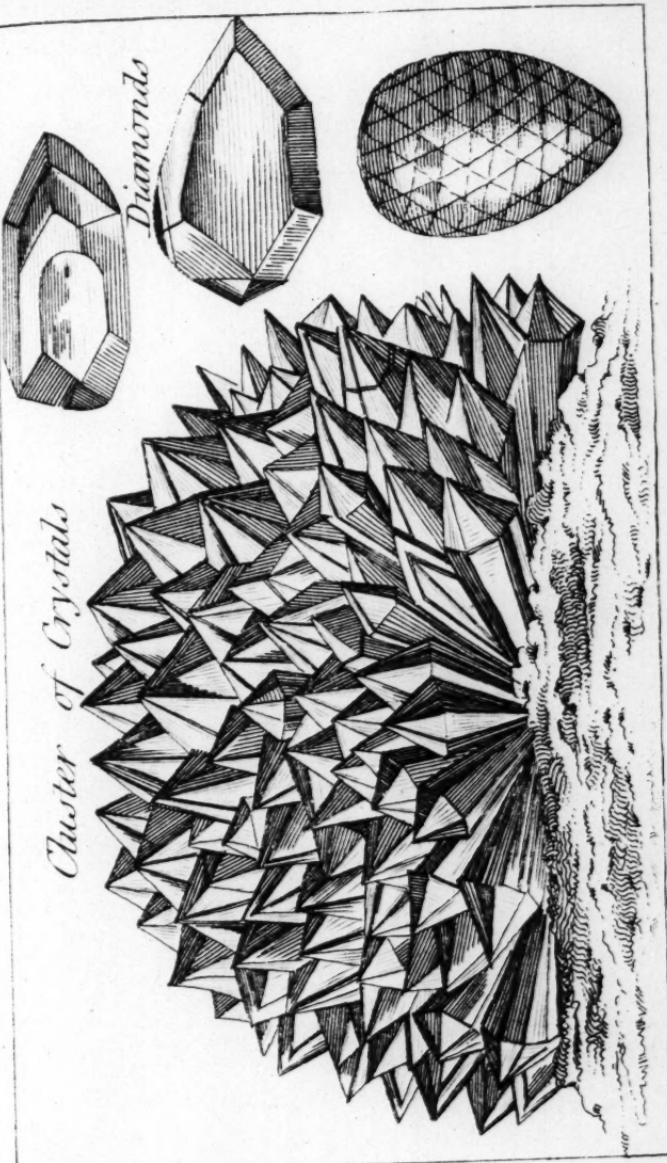
Conchites





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Cluster of Crystals





OF CRYSTAL.

CRYSTALS are hard, transparent, and naturally colourless bodies, of regular angular figures, composed of simple, not filamentous plates, not flexible, nor elastic, striking fire with steel, not fermenting with acid menstrua, and calcining in a strong fire. There are many and various species of it produced in different parts of the globe.

OF SPARS.

SPAR is a mixed body, consisting of crystal incorporated with different mineral, stony, earthy, or metallic substances. There are great varieties of them found in Germany; in England, the principal sorts are taken in Derbyshire, Cornwall, and North Wales.

OF SALT.

SALTS are fossile bodies, friable, pellucid, not inflammable, but fusible by fire, and congealing again in the cold; soluble in water, so as to disappear in it, naturally concreting into regularly figured crystals, and impressing a sensation of acrimony on the tongue. Salt gives all bodies consistence, preserves them from corruption, and occasions all the variety of tastes. They are of three kinds, *fixed*, *volatile*, and *essential*: *fixed* salt is drawn by calcining the matter, then boiling the ashes in a good deal of water; after this the solution is filtrated, and all the moisture evaporated, and the salt remains in a dry form at the bottom; this is

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called a *lixivious salt*. *Volatile salt* is that drawn chiefly from the parts of animals, and some putrefied parts of vegetables; it rises easily, and is the most volatile of any. The *essential salt* is drawn from the juice of plants by crystallization. It has been observed by the ancients, says Bacon, that salt-water will dissolve salt put into it in less time than fresh water.

Physicians are of opinion, that sea-salt has the same effects in the human body that it has out of it, in checking fermentation, and preventing putrefaction; they therefore esteem it of good use mixed with the generality of our foods in the stomach.

White salt is prepared from sea water, or any other kind of salt-water, first heightened into a strong brine by the heat of the sun and the operations of the air. It may also be prepared from a strong brine, or lixivium, drawn from earths, stones, or sands, strongly impregnated with common salt. Refined rock salt is that obtained by dissolving fossile or rock-salt in salt or fresh water, and afterwards boiling the solution. And, lastly, salt upon salt is made from bay-salt dissolved in sea-water, or other water, and boiled to a white salt.

OF NITRE.

NITRE, or Saltpetre, is a neutral salt, formed by the coalition of the common vegetable fixed alkaline salt with a peculiar acid: of a penetrating, acrid, bitterish taste, impressing a peculiar sense of coldness upon the tongue. It is soluble in eight times its weight of very cold

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cold water, in less than thrice its weight of water temperately warm, and in one-third of its weight of boiling water.

OF VITRIOL.

VITRIOL, which is either native or factitious, that is, produced by addition of a metallic matter with the fossil acid salt, is distinguished into white, blue, and green. White vitriol is brought in large lumps from Germany; it has the appearance of loaf sugar, and has a sweetish astringent taste. Blue vitriol is dry to the touch, and is formed into blue crystals like sapphires. It obtains its fine colour from copper, and has an austere taste, with great sharpness. Green vitriol has various names, according to the different places from whence it is taken. It abounds with iron, and is either in large crystals of a rhomboidal form, or in bits composed of crystalline grains united together, which feel a little oily to the touch; it has a sharp styptic taste. White vitriol is very good for making an eye-water, which is, perhaps, the best hitherto known for abating inflammations of the eyes, and to repel fluxions thereon. It is made by dissolving a scruple of vitriol in hot rose-water, and then passing it through a linen cloth. Blue vitriol, when calcined, is very proper for stopping haemorrhages, by cauterizing the vessels and condensing the blood therein. Spirit of vitriol, like other acid spirits, restrains the heat of the humours, stops haemorrhages, and operates as a diuretic.

OF ALUM.

ALUM is a semi-transparent, austere styptic salt, composed of the vitriolic acid, and a certain earth found in all the argillaceous fossils hitherto examined. It is of an acid taste, and leaves in the mouth a sense of sweetnes accompanied with a considerable degree of astringency. England, Italy, and Flanders, are the countries where alum is principally produced.

Burnt alum is nothing more than alum exposed to the action of the fire, by which means it liquefies and boils up like green vitriol; and when its phlegm is evaporated, forms a white spongy brittle mass.

OF SULPHUR.

SULPHUR is a mineral substance, fusible and inflammable by fire, and not dissoluble in water. It is a solid brittle concrete, of a yellow colour, inclining a little to a greenish, in some degree glossy. Held in the warm hand, it crackles or bursts, and leaves on the hand a particular smell. It is nearly twice as heavy as an equal bulk of water. It melts in a small degree of heat into a red pellucid fluid, and on cooling concretes again into its original appearance.

The principal use of sulphur is in fire-works, and for making gunpowder. It is likewise employed in some woollen manufactures in bleaching, for making cinnabar, by the wine-coopers, and for sundry economical and other like purposes.

poses. It is used medicinally against eruptions on the skin, and disorders of the lungs.

OF ARSENIC.

ARSENIC is extracted from a mineral called cobalt in Bohemia and Saxony. When mixed with calcined flints and pot-ashes, the mixture, in a very strong fire, will turn into a glass of a blueish colour, that when reduced to powder is called smelt. In the preparation of this glass a copious smoke is exhaled, which sticking to the sides of the furnace, and collected together, appears in the form of a white powder, which being put into a crucible, and melted in an exceeding strong fire, turns into a white, heavy, glassy mass. This is called white arsenic, and is a most dangerous poison. But by adding to ten parts of the former one of sulphur, melted as before, then yellow arsenic will be produced. If two parts of the sulphur are added to ten of the powder, and melted as before, it will become a reddish mass, which goes by the name of red arsenic.

OF COBALT.

COBALT is a fossile body, heavy, hard, almost black, and not very unlike antimony; when kindled in the fire it has a sulphureous nauseous smell, and is generally mixed with a portion of brass, and sometimes a little silver. Cobalt is found in some parts of England, particularly in Mendip hills in Somersetshire; but it is not thought so good as that of Saxony.

OF AMBERGRIS.

THIS is a marine bitumen, about the consistence of wax: it springs from the body of the earth; is sometimes found in the sea, condensed and floating on the water; sometimes thrown out upon the shores, and sometimes met with in the bodies of whales and other fishes. The greatest quantities of ambergris are found in the East Indies, about the island Madagascar, the Molucca islands, the western Sumatra islands, and on the Ethiopian coast. Ambergris is of various colours, but the ash-grey-coloured, with whitish, blackish, and yellowish streaks, or specks, is deemed the best. The best ambergris is light, like wax to the touch, crumbly, yet somewhat tenacious, so as to stick to the mortar or pestle: it has an agreeable smell, but no remarkable taste: it easily melts in the fire, takes flame from a candle, and burns away without intermission. Ambergris is used principally in a perfume, in balsams, snuffs, wash-balls, &c. It was formerly held in some esteem as a medicine, and said to possess nervine, analeptic, cephalic, and other virtues; but it is little regarded at present.

OF AMBER.

AMBER is a pellucid and very hard inflammable substance, brittle, and generally of a yellow or citrine colour; though sometimes it is whitish, and sometimes brown. The taste is somewhat acrid and bituminous, with a little

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astringency ; the smell, when warm, is fragrant and bituminous, and it is highly endowed with that remarkable property called electricity. When rubbed, it draws or attracts light bodies to it, as paper, feathers, &c. and by friction also it may be brought to yield light pretty copiously in the dark. Within some pieces of amber have been found leaves and insects included ; which seems to indicate, either that the amber was originally in a fluid state, or, that having been exposed to the sun, it was softened and rendered capable of receiving the leaves or insects. Amber is found in great plenty in regular mines in some parts of Prussia.

PIT-COAL.

PIT-COAL is a black, sulphureous, inflammatory matter dug out of the earth, and serving for fuel. It is common to all Europe, though that of England is in most repute. It is found in large strata, splitting horizontally more easily than in any other direction, of a glossy hue, soft and friable, not fusible, but easily inflammable, and leaving a large residuum of ashes. One species of coal is called cannel or canole coal, which is found in the northern counties, hard, glossy, and light, apt to cleave into thin flakes, and, when kindled, yields a continual blaze till it be burnt out.

Where the atmosphere is very moist, and full of watery vapours, so hurtful to human bodies, the burning of coals is very salutary. This at least is certain, that in London, since the burning of pit-coal has been almost universal,

versal, no plague has ever affected that city, nor any disease of the kind.

OF ANTIMONY.

ANTIMONY is a mineral substance of a metalline nature, having all the seeming characters of a real metal, except malleability, and may be called a semi-metal, being a fossil globe of some undetermined metal combined with a sulphureous and stony substance. Mines of all metals afford it; but that in gold mines is reckoned best. It has also its own mines in Hungary, Germany, and France. Its texture is full of little shining veins or threads, like needles, brittle as glass. Sometimes veins of a red or golden colour are intermixed, which is called *male* antimony; that without them being denominated *female* antimony. It fuses in the fire, though with some difficulty, and dissolves more easily in water. It destroys and dissipates all metals fused with it, except gold, and is therefore useful in refining. It is a common ingredient in speculums, or burning concaves, serving to give them a finer polish. It makes a part in bell-metal, and renders the sound more clear. It is mingled with tin to make it more hard, white, and sound; and with lead in the casting of printing-types, to render them more smooth and firm. In pharmacy it is used under various forms, and with various intentions, but chiefly as an emetic.

The regulus, that is, the metallic part of antimony, has been cast into pills, in which form it has acted as a cathartic. These pills, being sepa-

separated from the stools after their discharge, have been taken again and again with the same effect, but without any sensible loss of their weight or quality. They have been, therefore, called perpetual pills. A cup made with this regulus was called the antimonial cup ; wine poured into it presently became emetic, and no loss of the cup was observed thereby.

OF BISMUTH.

THIS is also called marcasite of silver, and tin glas. It is a hard, white, brittle, mineral substance, of a metalline nature, found in Saxony principally, though there is much of this mineral substance in the English county of Cornwall. It has been supposed a recrementitious matter thrown off in the formation of tin, though it usually contains some silver. An artificial bismuth is made for the shops, of tin.

OF BITUMEN.

THIS is also called carabe of Sodom, fossil pitch, and Jews pitch. It is a mineral sulphur, of a solid light substance, a dusky colour on the outside, and a deep shining black within, having but little taste or smell, except it is heated, in which case it emits a strong pitchy odour. It is not soluble in oils, nor in vinous spirits ; it melts but imperfectly in the fire. On burning it, a large quantity of ashes are left behind. It is found in the earth in many parts of Egypt, and floating on the surface of the Dead sea. At first it is soft, but grows hard by keeping.

OF

OF CINNABAR.

CINNABAR is either native or factitious. The native cinnabar is an ore of quicksilver moderately compact, very heavy, and of a peccant striated red colour. In this ore the quicksilver is mixed in different proportions with sulphur. When flesh broken, it is of a very bright glittering appearance; and it is generally found lodged in a blueish clay, though sometimes in a greenish talcy stone. Factitious cinnabar is a mixture of mercury and sulphur sublimed, and thus reduced into a fine red glebe. The best is of a high colour, and full of fibres resembling needles. This, as well as the native cinnabar, is excellent in epilepsies, and all complaints of the head and nerves; but the factitious is rather to be preferred. Cinnabar is also used by painters as a vermillion colour, and is rendered more beautiful by grinding it with gum water and a little saffron.

OF QUICKSILVER.

QUICKSILVER, called mercury by the chymists, is a naturally fluid mineral, the heaviest of all known bodies, except gold, and is the more heavy and fluid as it is the more pure. It is wholly volatile in the fire, and may be driven up in vapour by a degree of heat very little greater than that of boiling water; it is the least tenacious of all bodies, and every smaller drop may be again divided by the lightest touch into a multitude of others. The specific gravity of pure mercury is to wa-

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ter as 14,020 to 1000; and as it is the heaviest of all fluids, it is also the coldest; and when heated, the hottest. The ancients all esteemed quicksilver a poison, nor was it brought into internal use till about 250 years ago, when some shepherds ventured to give it to their sheep to kill worms; and as they received no injury by it, it was concluded that men might take it safely. In time, the diggers in the mines, when they found it crude, swallowed it in vast quantities, in order to sell it privately when they had voided it by stool. But the miners seldom live to follow their occupations above three or four years, and the artificers who have much dealing in it are generally seized with paralytic disorders. Mercury is of considerable use in gilding, making looking-glasses, refining gold, and various other mechanical operations, as well as in medicine. As a medicine it is used to promote the secretions in general, particularly the saliva. The true secret of curing diseases with mercury, is to cause it to circulate with the blood as long as possible, without producing any evacuation at all.

In the Venetian territories there are the greatest quantity of mines producing quicksilver; we have much from the East Indies; Spain and Hungary afford great quantities of it; in China, Japan, and many other places, it is met with; and about Montpelier, in France, there are some mines in which it is found.

OF GOLD.

THIS metal is found more or less in every country; but the greatest part of what we have comes from America, particularly from the mines of Potosi; but the Asiatic is esteemed the finest. Sometimes it is found pure and unmixed, in small grains or in large lumps, and is then called virgin gold; but it is usually found in ores of different kinds, to separate it from which various methods are required; its chief matrix is flint. All sand contains a greater or lesser quantity of it.

Gold is a yellow metal, the most dense and heaviest of all bodies, being nineteen times heavier (specifically) than water. Its ductility is such as to admit of one grain of it being drawn out to the length of 500 feet, which no other metal will: indeed it is the most divisible of all bodies, if melted with 100,000 times its weight of silver, it will be so perfectly blended with it, that any grain of the melted mass is, on assaying, found to contain its portion of gold: a single drop of its solution in aqua regia, gives a mettalline taste to a pint of the rectified spirit of wine. It is so ductile, that the wire-drawers can extend a leaf to the 12,000,000th part of an inch in thinness, over a flattened silver wire, which will be perfectly covered though viewed with a microscope. One grain of gold may be so beat out as to cover a large house, and still be so compact, as not to admit of rays of light through it.

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It is fixed and indestructible by the fire ; it suffers the heat of the greatest burning glass a long time before it evaporates. Antimony, which dissipates all other metals, leaves gold behind it. It is the only metal that resists the force of lead and glass of lead in fusion. It is not soluble in any of the simple acids in the common ways of making solutions ; but easily dissolves in a mixture of the nitrous and marine acids called aqua regia ; it is the sea-salt in this that dissolves this metal, for hardly any other salt will affect gold.

OF SILVER.

SILVER is sometimes found pure in the mine, but generally mixed with tin or lead. To the ore there often adheres a corrosive bituminous sulphur, which in fusion renders the silver volatile, or converts it into a glossy scoria : this loss is prevented by first roasting the ore, then reducing it to powder, afterwards adding mercury, and grinding them so long together, that the silver becomes wholly united to it, which may afterwards be separated by distillation.

The greatest mines are found in Chili and Peru, and there they separate it from the other mineral matters by pulverization, ablution with water, and amalgamation with mercury. The silver mines in England, Germany, and other parts of Europe, afford it mostly in an ore of a yellow, red, brown, or blackish colour, from an admixture of arsenic, sulphur, or both ; and this ore requires a calcination for the dissipation

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of the arsenic, &c. and then the silver is separated from the remaining earth by fusion.

It melts with nearly the same heat as gold, and is the next to it in ductility. It is the next to lead in point of gravity. It turns yellow and then black from the vapours of brimstone, or any sulphureous steams. It is eleven times specifically heavier than water. It is fixed, and indestructible by the fire; and is soluble only in the nitrous acid, with which it unites so strongly, that a heat which fuses the silver will not part them.

OF LEAD.

LEAD is a pale or livid white metal, soon losing its brightness in the air, and contracting a blackish or greyish ash-colour. It is very soft and flexible, unelastic, and uns sonorous. It is the heaviest of all metallic bodies, except gold, quicksilver, and platina; it is upwards of eleven times heavier than an equal bulk of water. It melts in a very moderate degree of heat, and long before it grows red hot: in a strong red heat it emits visible fumes.

If gold or silver be mixed with lead, and exposed to the fire, the lead scorches, as it would by itself, and arises to the surface, so as to be raked off in the form of glass or litharge; at the same time carrying with it an imperfect metal that the gold and silver had been mixed with, but leaving those perfect metals themselves unhurt. Hence gold and silver are purified by means of lead from mixtures of the baser metals. The litharge met with in the

shops

shops is produced in those works where gold and silver are thus purified, and contains the heterogeneous metals which the gold or silver had been mixed with. Lead exposed for some time to the steam of vinegar, or other vegetable acids, is gradually corroded into a white calx, which is the ceruss or white lead of the shops. The effects of lead on the human body are dangerous: those who are exposed to its vapours in the fire, and even those who grind its calces, minium, ceruss, and litharge for the painters, are subject to violent gripes and constipations of the bowels, contractions of the limbs, and other disorders. All the common lead ores contain some silver and copper.

OF TIN.

THIS metal is called by the chymists Jupiter. The characters of tin are, that it is the lightest, the least simple, and less fixed in the fire than any of the other metals. It is also soft, flexible, malleable, and may be drawn into wire, but not so well as iron; neither is it very sonorous or elastic. It melts more easily than any of the other metals, long before it ignites, and with a degree of heat a little greater than that of boiling water: it readily hardens again in the cold. When crude, or accompanied with its adhering sulphur, it dissolves only in aqua regia; but, when purified of its sulphur by calcination, it dissolves even in vinegar, and requires only a small proportion of that solvent. It so far endures lead and antimony in the refiner's test, as hardly to be separable from them, with-

out the assistance of copper. In many of its properties it approaches to silver.

Tin ore is principally found in Cornwall and Devonshire, whence all the rest of Europe is supplied with it. The metal is procured by roasting, grinding, washing, then melting the ore, and thus separating the scoria from it.

Tin is seldom used in medicine internally, though its virtues are highly extolled by some, but we fear upon no just grounds; particularly in diseases of the head, the lungs, and uterus, the falling-sickness, and the bite of a mad dog. It has been taken in crude filings, to the quantity of twenty grains, or more, for some time, without harm.

Besides the utensils and vessels made of this metal, it serves to preserve iron and copper; being extremely easy to melt, and, by means of any unctuous matter, adhering closely to them: it likewise serves in folders; amalgamated with mercury, it serves for the foiling of looking-glasses: by calcination it makes putty, which is of great use in the polishing of gems, and the making of enamels: it is a principal ingredient in pewter, as well as bell-metal: it mixes well with zinc and regulus of antimony, and thus becomes whiter and harder; but too much regulus makes it brittle. Tin is soluble only in aqua regia; and a solution of it tinges a solution of gold with a beautiful purple colour.

OF IRON.

IRON is a very hard and sonorous metal, which,

which, when polished, is of a shining colour, between white and livid, but, when unpolished, of a black colour. Iron is of two kinds, common and purified; this last is termed steel. No metal is so necessary for the uses of life as iron; nor is any metal found in so great quantities, almost in every country.

Steel is made of iron by frequent fusion and purification; and in the iron of some mines this conversion is easily obtained; in others with more difficulty; and accordingly the ways of performing it are different. If the iron be very good it is melted with furnaces; and to the melted metal are added, gradually, equal parts of salt of tartar, or any other alcaline salt, filings of lead, and shavings of bullocks horns, the metal being kept continually stirred. Afterwards the hardened mass is beat into small bars on an anvil.

Iron is the hardest of all metals, and steel is still harder and more rigid than iron, if, being ignited, it be thrown into cold water. Its specific gravity is to that of gold nearly as three to seven. Iron, long steeped in water, communicates to it a ferruginous taste, being dissolved by the water, and turned to a yellowish rust. Fileings of iron laid in a heap, and sprinkled with water, will grow so hot as to set fire to sulphur, if the heap be large. By calcining iron in a reverberatory furnace, it is reduced to a calx of a dark red or purplish colour. When ignited in a strong fire till it be near melting, and then beat by the hammer, it throws off scales, which are nothing but half-vitrified iron.

When it is melted in the refining furnaces, a part of it mixed with the charcoal, or other earthy parts, runs into scoriæ, which are a kind of glass. This metal is dissolved by all acids, but left untouched by alkaline salts. Filings of iron thrown upon any flame take fire, and emit green or red sparks.

Iron is the most useful of all metals for human life; for, besides the innumerable kinds of instruments made of it, it furnishes excellent remedies in many diseases. The medicinal virtues of iron, taken inwardly, were not unknown to the ancients. *Dioscorides* attributes to it an astringent virtue, and recommends it in uterine haemorrhages. He likewise orders wine, or water, in which a red-hot iron has been quenched, in the coeliac passion, lientery, and dysentery, and for restoring weak stomachs. Physicians now acknowledge a two-fold virtue in iron, one aperient, the other astringent. On these accounts, it is reckoned the grand specific in hypochondriacal affections, and all kinds of chloroses. Some attribute an aperient virtue to some preparations of iron, and an astringent virtue to others; but the truth is, all these preparations are both astringent and aperient, though not in the same degree. For medicinal uses iron is preferable to steel.

OF COPPER.

COPPER is a reddish metal, easily tarnishing in a moist air, and contracting a green, or a blueish green rust. It is the most elastic and sonorous of all the metals, and the hardest of all,

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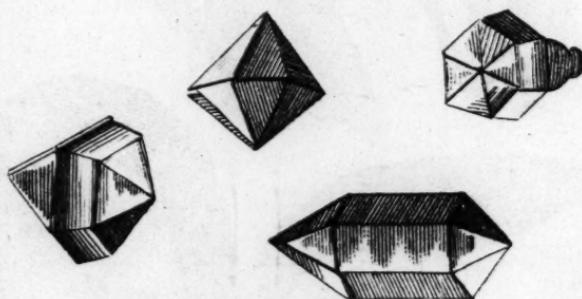
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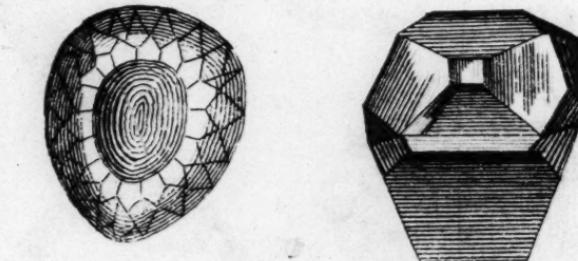
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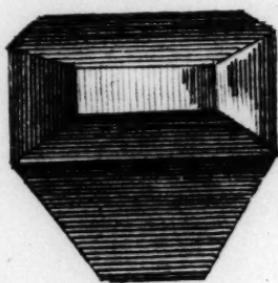
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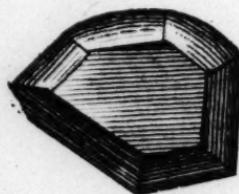
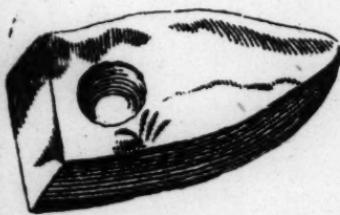
Diamonds







Diamonds



Ruby



all, except iron. It spreads with difficulty under the hammer, but may be extended to a great degree, drawn into a fine wire, and beat into thin leaves. Its specific gravity is almost nine times greater than that of water. It requires for its fusion a strong white heat, greater than that in which gold and silver melt, though not so great as that which is requisite for the melting of iron.

Ores of copper are to be found in almost every part of the known world.

OF DIAMONDS.

THIS stone, though naturally colourless like the purest water, is eminently distinguished from all others of the colourless kind by the lustre of its reflection. It is found sometimes of an annular, and sometimes in a pebble-like form. But, in whatever form the diamond is found, it is the same stone, and, when polished, has the same qualities in proportion to its perfection and purity. The small diamonds are the most plentiful, the others are found more and more rarely as they increase in size.

In its native state the diamond is sometimes bright, as if polished by art; but more frequently its surface is observed with foulnesses of various kinds; and sometimes it is, as the diamond-cutters term it, veiny, having certain points inconceivably hard on its surface. The diamond will endure the force of the strongest fire unhurt, though ever so long continued in it, provided it be not removed too suddenly into the cold air, when it will sometimes crack.

The

The places whence we have the diamonds are the East Indies, in the island of Borneo, and in the kingdoms of Visapour, Golconda, Bengal; and the Brasils, in the West Indies. The diamond is the hardest of all precious stones; it can only be cut and ground by itself, and its own substance.

OF THE CARBUNCLE.

THE carbuncle is an elegant gem, of a deep red, with a mixture of scarlet. It was known among the ancients by the name of anthrax. It is usually found pure and without blemish, and is as hard as the sapphire. It is naturally of an angular figure, and is found adhering by its base to a heavy and ferruginous stone of the einery kind; its usual size is about a quarter of an inch in length, and two thirds of that in diameter in its thickest parts. When held up against the sun it loses its deep tinge, and becomes exactly of the colour of a burning charcoal; whence the propriety of the name which the ancients gave it. It suffers no alteration in the fire; neither parting with its colour, nor becoming paler by it. It is found only in the East Indies, and is not very common even there.

THE RUBY.

THIS is a beautiful gem of a red colour, with a mixture of purple. In its most perfect and best-coloured state, it is a gem of extreme beauty and value. It is often found perfectly pure, and free from blemishes or foulness, but it

it is much more frequently greatly debased in its value by such blemishes and defects, especially in the larger specimens. It is equal in hardness to the sapphire, and second only to the diamond. It is various in size, but more regular in its shape than most of the other gems: its most common size is equal to that of the head of the largest sort of pins; but it is found of four, eight, or ten carats; and sometimes, though very rare, up to twenty, thirty, or forty. It is always found of a pebble-like figure, frequently roundish, sometimes oblong, and much larger at one end than at the other, and in some degree resembling a pear, though usually flattened on one side. In general it is naturally so bright and pure on the surface as to require no polishing; and when its figure will admit of being set without cutting, it is often worn in its rough state, and with no other than its native polish.

We have the true ruby only from the East Indies, and the principal mines of it are in the kingdom of Pegu and the island of Ceylon.

THE GARNET.

THIS is a very beautiful gem, of a red colour, with a mixture of blueish. When pure, and free from blemishes, it is not much inferior, in appearance, to the oriental ruby; tho' only of a middle degree of hardness between the sapphire and the common crystal. It is found of various sizes, from that of a pin's head, to an inch in diameter. Being found in Europe, as well as the East Indies, garnets are distin-

distinguished into the oriental and occidental kinds. The oriental ones are principally brought from Calicut, Cananor, and Cambay; and the European ones are common in Italy, Hungary, and Bohemia.

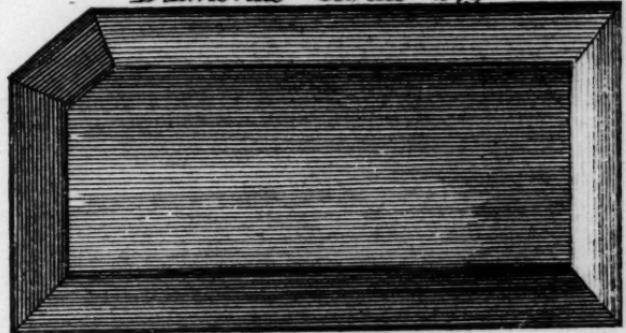
THE AMETHYST.

THIS is a gem of a purple colour, resembling a violet, and sometimes fading to a pale rose colour. It is transparent and bright, and has its name from a supposition that it prevented drunkenness. The best of these gems are met with in the East Indies, but they are very rare. Many are brought from America, but more from Bohemia. They are usually found in the form of large crystals, on the inside of large hollow stones. Sometimes these stones are found colourless, and they may at any time be made so by exposing them to the fire: in which pellucid, or colourless state, they so nearly imitate the diamond, that even jewellers are often deceived, as they require nothing but the hardness to render them equal to that gem. They are found of various sizes, and in various shapes, from the size of a small pea to an inch and an half in diameter.

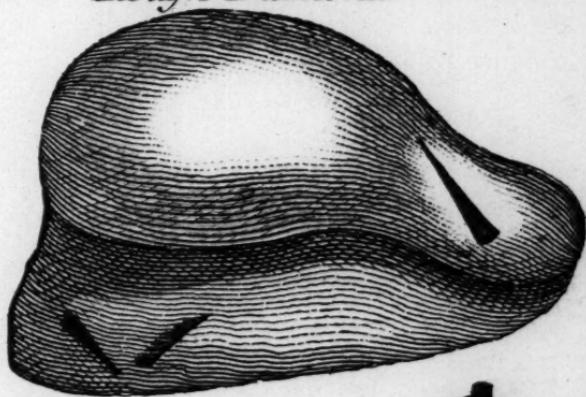
OF PEARL.

PEARL is a hard, white, shining body, usually roundish, found in a testaceous fish resembling an oyster. Pearls, though esteemed of the number of gems, and though they have been highly valued in all ages, proceed only from a distemper in the creature that produces them,

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Rough Diamond



Pearl





them, analogous to the bezoars and other stony concretions in several animals of other kinds ; and what the ancients imagined to be a drop of dew, concreted into a pearl in the body of the pearl fish, (which they supposed rose from the bottom of the surface of the water to receive it) is nothing more than the matter destined to form and enlarge the shell, bursting from the vessels destined to carry it to the parts of the shell it should have formed, and by that means producing these little concretions. The East Indian pearl-oyster is the fish in which these are usually produced. Though this article is not properly entitled to a place here, yet as it is looked upon as one of the gems, we could not omit mentioning it.

THE SAPPHIRE.

THIS is a pellucid gem, which, in its finest state, is extremely beautiful and valuable, and second only to the diamond, in lustre, hardness, and value. Its proper colour is a pure blue ; in the finest specimens it is of the deepest azure, and in others varies into paleness, in shades of all degrees between that and a pure crystal brightness and water ; without the least tinge of colour, but with a lustre much superior to the crystal. They are thus distinguished into four sorts : the blue sapphire, the white sapphire, the water sapphire, and the milk sapphire. The finest are brought from the kingdom of Peru, in the East Indies.

OF THE EMERALD.

THIS is the most beautiful of all the class of coloured gems, when perfect. It is sometimes found in the roundish or pebble form, sometimes in the columnar or crystalline form: the pebble emeralds, however, are the most valued. These are found loose in the earth of mountains and in the beds of rivers: they are, in their natural state, bright and transparent, though less glossy than the columnar ones. Both, however, are generally of a perfect and pure green. It has this green in all the different shades, from very dark to extremely pale, and is sometimes entirely colourless; though the English jewellers then call it white sapphire. Emeralds are found in the East Indies and in many parts of America, particularly about the gold mines of Peru.

THE CHRYSOLITE.

THIS gem was known by the ancients under the name of the TOPAZ; and the true chrysolite of the ancients, which had its name from its fine gold colour, is now universally called topaz by modern jewellers.

THE BERYL.

THIS is a precious stone, and is also called aqua marina, on account of its sea-green colour. It is crystal coloured with copper. It is transparent, and different pieces have different shades, even to yellow. Those which are gold-coloured are called the gilded beryl.

The

The most beautiful aqua marina comes from the East Indies.

THE ONYX.

THIS is one of the semi-pellucid gems, with variously coloured zones, but none of them are red; being composed of crystal, debased by a small mixture of earth, and made up of a number of flat plates, or of a series of coats, and separated from each other by veins of a different colour, resembling zones or belts.

THE AGATE.

THE agate is a precious stone, resembling the onyx in colour, but has no zones like those with which the onyx is decorated: instead of which the agate has lines or spots of various colours, so disposed as to represent the pictures of different objects, as woods, rivers, fruits, flowers, herbs, and clouds, but not very distinctly. The sizes are various, being sometimes only one inch in diameter, and sometimes eight inches. It is of a very firm, compact, and fine texture, though found in the shape of a flinty pebble stone. The white veined agate, with delineations of trees and mosses, is usually known by the name of the mocha stone.

OF THE JASPER.

JASPERs are of a complex irregular structure, of a great variety of colours, and emulating the appearance of the finer marbles, or semi-pellucid gems. Their great characteristic is, that they all readily strike fire with steel,

and make not the least effervescence with aqua fortis. The several kinds of nephritic stone, and the lapis divinus, or jade, are all genuine jaspers; but the hard, bright, green jasper of the East Indies seems to be the true medicinal kind. It is found in masses of various sizes and shapes, but the common standard, as to size, is between four and six inches in diameter. It is generally simple and unmixed; but if it be in any degree variegated, it is always with white; and this is not disposed in streaks or veins, but in clouds. It is capable of a very fine polish, and when the white clouds are well disposed, is very beautiful.

OF SLATE.

THIS is a blueish fossile stone, very soft when dug out of the quarry, and therefore easily cut or sawed into long thin squares, to serve instead of tiles for the covering of houses, &c. Slate, smoothed and framed, is used in schools for youth to perform their operations in arithmetic, as the least moisture will obliterate any thing that may have been written on it by a pencil made of the same stone.

THE MAGNET.

LOADSTONE is a very rich iron ore, found in large detached masses, of a dusky iron grey, often tinged with brownish or reddish, and when broken appearing something like the common emery, but less sparkling. It is very heavy, considerably hard, of a perfectly irregular and uneven surface, and of a firm structure,

ture, but usually with some porous irregularities within. It is found in England, and all other places where there are iron mines, and its great character is that of attracting iron.

The power or force of magnets is generally greater in small than in large ones, in proportion to their bulk. It is very rare that very large ones will take up more than three or four times their own weight, but a small one is but tolerably good that will take up no more than eight, ten, or twelve times its weight.

OF MARBLE.

MARBLE is a genus of fossils, being a bright and beautiful stone, composed of small, separate concretions, moderately hard, not giving fire with steel. Of a stone so well known it will not be necessary for us to say more, than that its various colours have been arranged under fourteen divisions.

OF ALABASTER.

ALABASTER is the name of a genus of fossils, nearly allied to marble: it is a bright elegant stone, and will receive a fine polish, but it is brittle. There are very large strata of it in Arabia, Egypt, and many parts of Italy. It has also been found in Germany, France, and Derbyshire.

OF PORPHYRY.

THIS is a kind of marble of a plain uniform mass, spotted with separate concretions, of great hardness, and giving fire with steel. It

is found in immense quantities in Arabia Pe-
træa, and is often met with in England, Ireland,
and Germany.

THE GRANITE.

THIS is a distinct genus of stones, com-
posed of separate and very large concretions
rudely compacted together, of great hardness,
and capable of receiving a very beautiful polish.
It is much used in London for the steps of pub-
lic buildings, and on other occasions, where
great strength and hardness are required.

OF FLINT, OR FLINT STONES.

THIS is a semi-pellucid stone, composed of
crystal, debased with earth, of one uniform
substance, and free from veins: it is of different
degrees of colour, according to the quantity of
earth it contains, and naturally surrounded
with a whitish crust. It is of an extremely
fine, compact, and firm texture, and very va-
rious, both in size and figure. It is of all the
degrees of grey, and from nearly quite black,
to almost quite white. It breaks with a fine,
even, glossy surface, is moderately transparent,
very hard, and capable of a fine polish. It
readily strikes fire with steel, makes not the
least effervescence with aqua fortis, and burns
to a whiteness.

The uses of flints, in glass-making, are too
well known to require any particular recital.
For the nicer operations in the glass trade they
are thus prepared: after freeing them from
the white crust, in which they are usually in-
closed

closed, calcine them in a strong fire; then powdering them in an iron mortar, sift the powder through a very fine sieve; pour some aqua fortis upon this powder, to dissolve any particles of iron it may have got from the mortar; then, after standing some time, let it be well washed with hot water, and dry it for use.

OF SAND.

SAND is a genus of fossils, the characters of which are, that they are found in minute concretions, forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate shape, and appear regular, though more or less complete concretions; not to be dissolved or disunited by water, or formed into a coherent mass by means of it, but retaining their figure in it; transparent, vitrifiable by extreme heat, and not dissoluble in, nor effervescent with, acids.

Sand is of great use in the glass manufacture; the white writing-sand being employed for making of the white glass, and a coarse greenish-looking sand for the green glass.

In agriculture, it seems to be the office of sand to make unctuous earth fertile, and fit to support vegetables, &c. For earth alone, we find, is liable to coalesce and gather into a hard coherent mass, as appears in clay; and being thus embodied, and, as it were, glued together, is less disposed to nourish vegetables. But if such earth be mixed with sand, its pores are thereby kept open, and the earth itself loose, so as thus to give room for the juices to ascend, and

for plants to be nourished by it. A vegetable planted only in sand, or in a fat glebe, or in earth, receives little growth or increase; but a mixture of both renders the mass fertile. In effect, earth is in some measure made organisal by means of sand; pores and spaces, something analogous to vessels, being thereby maintained, by which the juices may be conveyed, prepared, digested, circulated, and at length discharged.

OF BOTANY.

BOTANY is that branch of natural history which treats of plants, their several kinds, forms, and uses.

The word comes from *βολαν*, *herb*; and that from *βολος*, of *βω*, *I feed*; because most animals feed on herbs.

Authors are divided about the precise object and extent of botany, which some will have to include the whole province of plants, in all their states, uses, and relations; others restrain it to the knowledge of the classes, genera, species, external figures, and description of plants, exclusive of their origin and generation, which belong to physiology; of their culture and propagation, which belong to gardening and agriculture; and of their virtues, which are the objects of consideration in physic and pharmacy.

This science was cultivated in some degree among the ancients; but chiefly with respect to its medical application and use. However, as they adopted no regular system of distribution

tion and arrangement, they made a slow progress, and the knowledge they gained was soon and easily lost. If we except Solomon, of whom we read, that *he spake of trees from the cedar-tree that is in Lebanon, even unto the hyssop that springeth out of the wall*, 1 Kings, iv. 33, and begin only with those writers on the subject of botany, any of whose writings now remain, the first, in order of time, is Hippocrates, who flourished in the fifth century before Christ, and who has enumerated about 250 different plants. Aristotle also may be mentioned, though there is reason to doubt, whether the books concerning the generation of plants, which some have ascribed to him, are his, or a collection by some late writer from the works of Theophrastus. Theophrastus, the disciple of Aristotle, is therefore properly the next to Hippocrates, on the genuineness of whose writings we can depend; he flourished about 300 years before Christ; there remain nine books of his on the history of plants, and six on the causes of them: he reckons about 500 plants.

Among the Romans, Cato, Varro, Virgil, and Columella, might be mentioned; but the most eminent were Dioscorides, who lived under Anthony and Cleopatra; he is called the prince of botanists, and yet the number of plants which he has described amount only to 600; and C. Plinius Secundus, under Vespasian and Titus, who enumerates more than 1000 plants. Galen, of Pergama in Asia, who lived at Rome about the year 133, though he did not write professedly on botany, has introduced

many

many incidental observations on this subject; and other physicians prosecuted this study, as far as it was immediately connected with that of their profession, from the second to the sixth century of the Christian æra; such as Oribasius, Ætius, Trallianus, and P. Ægineta. The principal Arabian botanists, who mostly with the same views cultivated this science from the eighth to the twelfth century, were Mefue, Serapio, Razis, Avicenna, and Averrhoes. The succeeding period, till the fifteenth century, was very unfavourable to every kind of science; however, in that century, and especially in the next, botany was industriously revived by means of numerous and laboured commentaries on Theophrastus, Dioscorides, Pliny, Cato, Avicenna, and Mefue: and the principal persons who were employed in this way were Leonicenus, Brasavolus, Cordus, Fuchsius, Bodæus, Matthiolus, and Dalechampius. Turner, Gerard, and Tradescant, were the first botanists in England; they applied themselves to the culture of medical and rare plants towards the close of the sixteenth century. It was after this period that botany began to acquire a considerable degree of importance and reputation; and that ingenuity and industry were employed in collecting and classing new species of plants. It would be tedious even to recount all the names of those who were distinguished in this respect; let it suffice to mention Gesner, Dodonæus, Cæsalpinus, Proper Alpinus, the two Bauhins, Columna, Parkinson, Plukenet, Morrison, Malpighi, Grew,

Her-

Hermannus, Ray, Magnol, Tournefort, Sloane, Sherrard, Linnæus, and Miller. In a word, botany is arrived at a degree of perfection among the moderns, to which the ancients were strangers; not only as to the method of classing, distributing, and characterising plants, but also as to the *copia* or number of plants known and described. The numerous travels and voyages of botanists have very much contributed to the extent of this science.

The science of botany is differently explained by different authors; but the two systems of Tournefort and Linnæus more especially deserve our consideration. It is to be observed, that Linnæus has established a new system of botany, founded on the number and different structure observable in the male and female parts of generation of each plant; the former of which is called stamen, or stamina, when there are more than one of them; and the latter pistil.

Stamina, according to the generality of botanists, are the male organs of generation in flowers. Geoffrey and Linnæus explain the generation of plants in a manner analogous to that of animals, and maintain the use of the *stamina* to be that of secreting, in their fine capillary canals, a juice, which is collected, hardened, and formed into a farina, or dust, in the tips of the apices upon the tops of the pistil, whence is a passage for it to descend into the uterus, where, being received, it impregnates and fecundifies the plant. This doctrine, however, is opposed by some of the writers of

the

the present age, and particularly by Dr. Alston, professor of botany at Edinburgh, who, in an express dissertation on the sexes of plants, undertakes to overthrow all the arguments in favour of the sexes of plants, by repeated experiments.

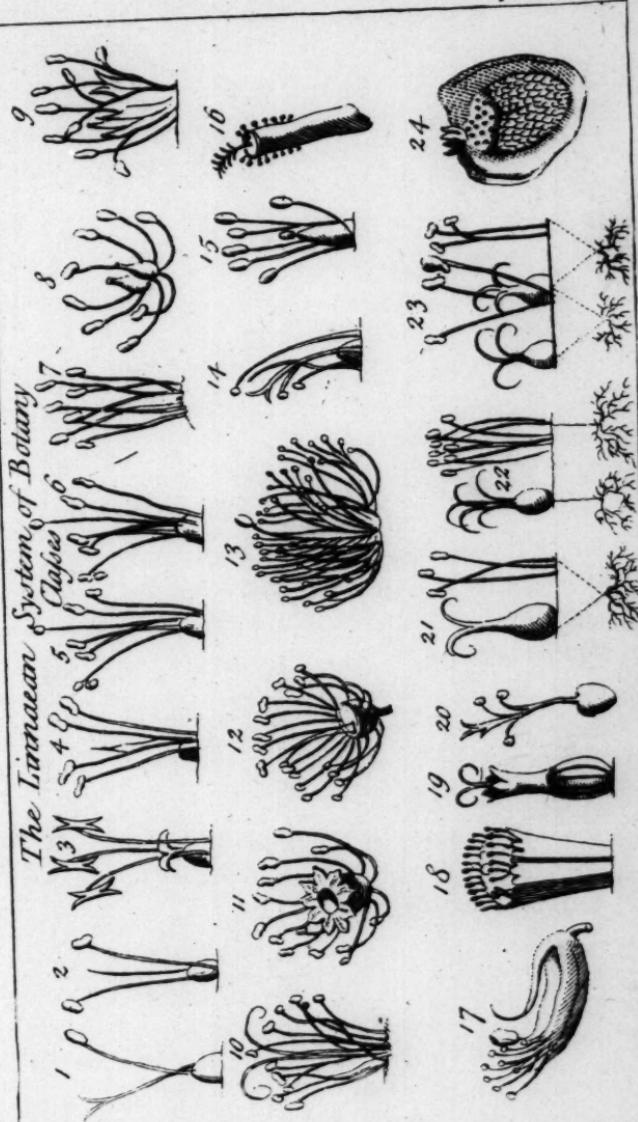
Pistil, as already observed, denotes the female organ of generation in plants: it consists of three parts, the germen, style, and stigma: the germen supplies the place of an uterus in plants, and is of various shapes, but always situated at the bottom of the pistil, and contains the embryo-seeds: the style is a part of various forms also, but always placed on the germen: and the stigma is also of various figures, but always placed on the top of the style, or, if that be wanting, on the top of the germen.

From the number and situation of the stamens, Linnæus has arranged the whole family of plants under twenty-four classes. 1. The Monandria. 2. Diandria. 3. Triandria. 4. Tetrandria. 5. Pentandria. 6. Hexandria. 7. Heptandria. 8. Octandria. 9. Enneandria. 10. Decandria. 11. Dodecandria. 12. Icosandria. 13. Polyandria. 14. Didynamia. 15. Tetrodynamia. 16. Monadelphia. 17. Diadelphia. 18. Polyadelphia. 19. Syngenesia. 20. Gynandria. 21. Monœcia. 22. Diœcia. 23. Polygamia. 24. Cryptogamia.

The Monandria is a class of plants with only one stamen or male part in each flower. To this class belong canna, &c.

The Diandria is a class of plants comprehending all those with hermaphrodite flowers, and

The Linnaean System of Botany





and only two stamens on each; such are sage, olive, jessamin, rosemary, &c.

Triandria is a class of plants that comprehends all such plants as have hermaphrodite flowers, with three stamens, or male parts in each. To this class belong the tamarind, valerian, saffron, gladiol, iris, &c.

Tetrandria is a class of plants comprehending all such plants as have hermaphrodite flowers, with four stamens, or male parts, in each.

Pentandria, one of Linnæus's classes of plants, comprehending those which have hermaphrodite flowers with five stamens, or male parts, in each. To this genus belong the vine, the elm, &c.

Hexandria, a class of plants comprehending all those which have hermaphrodite flowers, and six stamens in each. To this class belong the narcissus, garlick, daffodil, lily, &c.

Heptandria, a class of plants comprehending those that have hermaphrodite flowers and seven stamens in each.

Octandria, a class comprehending those plants which have hermaphrodite flowers, and eight stamens, or male parts, in each.

Enneandria, a class of plants with hermaphrodite flowers, and nine stamens, or male parts, in each. To this class belong the laurus, rheum, spondias, and butomos.

Decandria, a class of plants having hermaphrodite flowers with ten stamens in each.

Dodecandria, the eleventh order of plants, contains all those with hermaphrodite flowers;

and eleven stamens in each; such are agrimony, asarum, &c.

Icosandria, a class of plants, the twelfth in order: the cup of the flower is monophyllous and hollow, with the corolla affixed by the unguis to its sides, and about twenty stamens inserted either into the side of the cup or the corolla. To this class belong the cactus or torch thistle, the amygdalus or almond tree, the cherry, &c.

Polyandria, a class of plants, the thirteenth in order, with hermaphrodite flowers, and a large number of stamens, or male parts, in each: these always exceed the number of twelve, and grow on the receptacle of the future seed.

Didynamia, a very comprehensive class of plants, and the fourteenth in order; the essential characteristic of which is, that there are four subulated stamens inserted into the tube of the flower; two of which are shorter than the others, and placed together. To this genus belong baum, germander, lavender, thyme, betony, mint, basil, fox-glove, &c.

Tetradynamia, a class of plants whose flowers have four of their stamens of more efficacy than the rest; these are always known by having the four efficacious stamens longer than the rest.

Monadelphia, a class of plants, the fifteenth in order: the stamens of the flowers are so interwoven as to form one body. To this class belong the mallow, alcea, althaea, and hibiscus.

Diadelphia, the seventeenth class of plants, comprehending all those with papilionaceous and hermaphrodite flowers, and leguminous seed vessels.

Polyadelphia, a class of plants, the eighteenth in order, whose stamina are connected together at their bases into several series.

Syngenesia, the nineteenth class of plants, according to Linnæus; so called because the stamina in these plants grow together, or are formed into a single regular congeries.

Gynandria, a class of plants, the twentieth in order; comprehending all those whose stamina are placed either on the style or the receptacle, elongated into the form of a style, and carrying on it both the pistil and stamina.

Monœcia, the twenty-first in order of Linnæus's class of plants, in which the male and female flowers are placed separately on the same plant, or rather on different stalks growing from the same root.

Diœcia, in the Linnæan system, is the twenty-second class of plants, comprehending all those which have the male and female parts of fructification, or the stamina and pistil on distinct plants of the same kind; in which respect they bear some analogy to quadrupeds, whose sexes are likewise distinct.

Polygamia, the twenty-third class of plants; the characters of which are, that they have flowers of different structure; some having male flowers, others female, and others hermaphrodite.

Cryptogamia, the twenty-fourth in order of Linnæus's class of plants; the organs of fructifica-

tification of which are either concealed within the fruit itself, or are so minute as to escape observation. To this genus belong the mosses, mushrooms, ferns, liver-worts, &c.

Such are the general classes of plants established by that excellent botanist Linnæus, who farther subdivides them into orders from the number of pistils, &c.

Having thus briefly explained the system of Linnæus, we come to that of Tournefort, which is founded on the different structure and disposition observable in the flowers, or, more strictly speaking, the flower-leaves of plants.

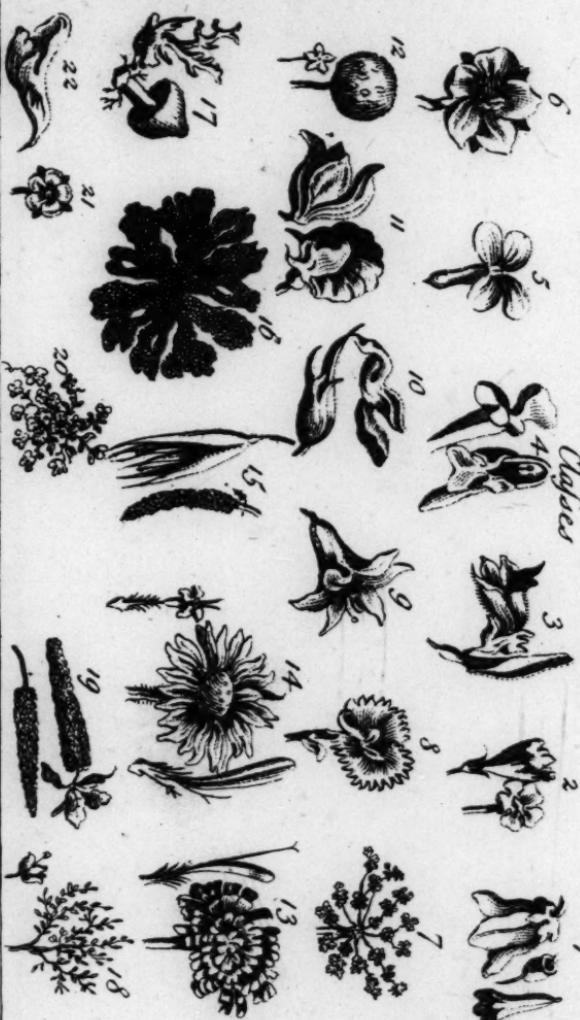
All plants are ranged by Tournefort under one or other of the following classes, viz.

1. Plants with monopetalous, campaniform, or bell-fashioned flowers.
2. Those with monopetalous, infundibuliform, or funnel-like flowers.
3. Plants with anomalous monopetalous flowers.
4. Plants with polypetalous labiated flowers.
5. Plants with polypetalous cruciform flowers.
6. Plants with polypetalous rosaceous flowers.
7. Plants with polypetalous, rosaceous, and umbellated flowers.
8. Plants with caryophylloous, or pink-like flowers.
9. Plants with liliaceous, or lily-like flowers.
10. Plants with polypetalous, papilionaceous flowers.
11. Plants with polypetalous anomalous flowers.
12. Plants with flosculous flowers.
13. Plants with semi-flosculous flowers.
14. Plants with radiated flowers.
15. Plants with staminous flowers.
16. Plants without flowers, but having visible seeds.
17. Plants with neither visible flowers nor seeds.
18. Trees with apetalous flowers.



Tournefort's System of Botany

Claves



19. Trees with apetalous amentaceous flowers.
20. Trees with monopetalous flowers.
21. Trees with rosaceous flowers.
22. Trees with papilionaceous flowers.

Each class in this system contains several *genera*, amounting in the whole to 673, and comprehending 8846 species, to which the author afterwards added 1300 more, referring them to the proper genera in his system.

We shall conclude this volume with a brief account of the principal systems that have been established by botanical writers. Linnæus distributes the systems which have already obtained into *heterodox* and *orthodox*. The former are founded in an alphabetical arrangement; in the structure of the root; in the different species of flowers: in the *habit* of plants; their time of flowering; their native soil and climate; their medicinal use, and the order of the dispensaries. The *orthodox* systems, as he calls them, are either universal or partial; such as belong to plants in general, or such as are accommodated to the nomenclature and arrangement of particular kinds. The universal systems are four; though, by various modifications, this number has been considerably augmented. Linnaeus has distinguished the several patrons of them under the classes and appellations of *Fructiflæ*, *Coroliflæ*, *Calyciflæ*, and *Sexualiflæ*. The *Fructiflæ* are such as form the several classes of vegetables from the *pericarpium*, the *seed*, and the *receptacle*; of this number are Cæsalpinus, Morrison, Ray, Knaut, Hermann, and Boerhaave. The *Coroliflæ* distinguish the several

several classes by means of the *corolla* and *petals*; such are Rivinus and Tournefort, and their disciples. The *Calycistæ* distribute them from the *calyx*, as Magnol; and the *Sexualists* found their system on the different sexes of plants. To this compendious abstract of the history and principal systems of botany, it may be proper to add, that Cæsalpine, who was an Italian physician in 1583, was the first systematical writer, and he distributed plants into classes, according to the form of their seeds: Ray, from being first a *Fructist*, became afterwards a *Corolist*: Boerhaave endeavoured to combine the systems of Hermann, Ray, and Tournefort; but as the system of the latter was at one time very generally received, and notwithstanding the prevalence of the Linnæan or sexual system, has still some advocates, it may be proper to observe, that Tournefort considers plants as composed of five parts, viz. roots, stalks, leaves, flowers, and fruit; neglecting the three former parts, he distributes them into various classes, according to the disposition and structure of the flower; and in resolving them into genera, he takes into consideration both the flower and the fruit. Mr. Ray, urged chiefly by the short duration of the flower, sought the characters of the several genera, not merely in the flower and fruit, but in the figure of the organisical parts, as the leaves, stalks, and roots, and in their colour, smell, taste, and the outward surface of the whole plant.

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